U. S. Government

RESEARCH REPORTS

June 20, 1964
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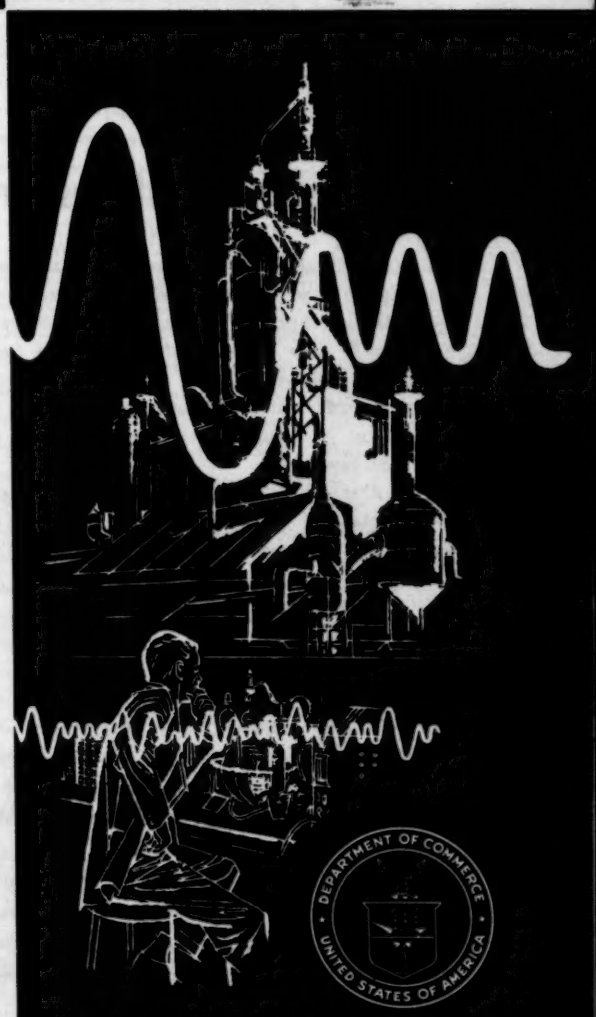

U. S. DEPARTMENT OF COMMERCE

Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

OFFICE OF TECHNICAL SERVICES
Donald A. Schon, *Director*

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-435 113 Div. 1
OTS price $5.60

Douglas Aircraft Co., Inc., Long Beach, Calif.
DEVELOPMENT OF IMPROVED STATIC PRESSURE SENSING PROBES FOR ALL MACH NUMBERS.
Final rept., phase 3, 1 Jan-31 Dec 63.
6 Feb 64, 57p. Rept. no. LB31575
Contract NOw62 0297t, Task Order 62 7
Unclassified report

Descriptors: (*Pressure gages, Airspeed), Design, Transonic characteristics, Supersonic characteristics, Orifices, Aircraft, Guided missiles, Angle of attack, Yaw, Configuration, Experimental data, Airspeed indicators, Pitot tubes.

Systematic, analytic methods are investigated for the design of static pressure probes which will correctly sense free-stream static pressure independently of Mach number, Reynolds number, and flow inclination. The design of two servic-type static pressure probes designed by this method is described and the results of wind tunnel tests are analyzed. Both service-type probes had total pressure sensors in their noses and contained internal heating elements. The external shape of both service-type probes is identical, and they differ only in the internal ducting used to obtain insensitivity of the static pressure to angle of attack and yaw. During the tests both probes appeared to sense static pressure fairly well at zero angle of attack and yaw, and one of them also did fairly well at angle of attack and yaw. In particular, one probe sensed static pressure with errors less than those specified except for Mach numbers between 0.95 and 1.00 where there is considerable doubt as to the validity of the data. Variation of sensed total pressure with angle of attack was negligible, and the heating element had no effect on the sensed pressures. However, serious inconsistencies in in the wind tunnel data cast doubt on the validity of evaluating the probes by these tests. (Author)

AD-435 543 Div. 1, 23
OTS price $10.50

Grumman Aircraft Engineering Corp., Bethpage, N.Y.
THE EFFECT OF VARIATIONS IN MOTION FIDELITY DURING TRAINING ON SIMULATED LOW-ALTITUDE FLIGHT.
Rept. for Mar 61-Apr 62,
by Howard Sherman, C. Thomas Goldsmith and Patrick A. Vitale. Dec 63, 131p.
Contract AF33 616 8029, Proj. 1710, Task 171003
AMRL TDR63 108 Unclassified report

Descriptors: (*Flight simulators, Low altitude), (*Aerospace craft, Simulation), (*Personnel, Performance tests), Tracking, Training devices.

Two experiments testing the effects of variations in the fidelity of simulated motion during training on performance in a simulated low-altitude, high-speed mission were performed. The simulated mission required subjects to perform a one-dimensional (vertical) compensatory tracking task, while experiencing moderately heavy clear air turbulence. The research led to the following conclusions: (1) providing simulated motion during the learning of tracking skills, contributes to more effective performance in criterion situations in which motion cues play an inportant role; and (2) performance on a procedural task (reaction time measures) during criterion testing did not differ significantly as a function of the type traning received. (Author)

AD-435 547 Div. 1, 30, 23
OTS price $9.10

deFlorez Co., Inc., Englewood Cliffs, N.J.
THE DEVELOPMENT, APPLICATION, AND STUDY OF THE POINT LIGHT SOURCE TECHNIQUE DEVICE 2FH4.
Final engineering, operation, and maintenance rept.
Sep 63, 107p.
Contract NONR1628 00
NTDC 1628 16 Unclassified report

Descriptors: (*Flight simulators, Display systems), (*Training devices, Helicopters), Terrain, Motion picture projectors, Maintenance, Pitch (Motion), Roll, Yaw, Servomechanisms, Motion, Operation, Mercury lamps, Flight instruments.

Device 2FH4 was designed and developed to provide a research, development and evaluation tool for studying problems associated with a flight simulator requiring visual presentation. This report is the final engineering, operation and maintenance report for the complete device and includes a discussion of the principles involved in the operation of the Device 2FH4 and its application to the point light source visual presentation technique. The maintenance section of the report contains instructions on routine inspection, general maintenance, lubrication procedures, and a trouble-shooting guide for analysis and locating typical problems which may confront maintenance personnel charged with maintaining Device 2FH4. (Author)

AD-435 558 Div. 1, 19
OTS price $7.60

Young, David W. and Associates, Inc., Canoga Park, Calif.
JANAIR JOINT ARMY-NAVY AIRCRAFT INSTRUMENTATION RESEARCH. HIGH SPEED, RASTER SCANNING, HIGH RESOLUTION, RADAR SENSOR FOR VERTICAL DISPLAY.
Interim technical rept., 1 Sep 62-30 July 63.
30 July 63, 80p.
Contract Nonr4032 00
Unclassified report

Descriptors: (*Vertical indicators, Radar scanning), (*Display systems, Terrain avoidance), Instrument flight, Radar antennas, Instrument landings, Terrain, Resoludion, Helicopters, Monopulse radar, Continuous wave radar, Slot antennas, Night landings, Phase shifters, Photographs, Radar transmitters, Circuits, Waveguides, Phased arrays, Ferrites,

Switching circuits, Aircraft landings, All-weather aviation, Height finding, Airborne, Flight instruments.

This radar system concept, when instrumented and installed in a helicopter or fixed wing aircraft, would fully enable a pilot to perform a blind landing during inclement weather without aid or assistance of any kind from ground installations and, further, to be capable of both manual and automatic terrain following. This is to be possible with a simple, light-weight radar system. The antennas are the key elements in the system and are fairly long, but their width and depth is very small. The system is a high speed, raster scanning, high resolution radar used with a vertical display. The result is similar to television with range measurement capability. A transparent windshield display is introduced to allow correlation or comparison of human optical sensing and microwave (radar) sensing. (Author)

AD-435 733 Div. 1
OTS price $6.60

Bell Helicopter Co., Fort Worth, Tex.
JOINT ARMY-NAVY AIRCRAFT INSTRUMENTATION RESEARCH PROGRESS REPORT,
by D. E. Rosenquist, E. V. McDowell, H. W. Upton and D. J. Dougherty. Jul 63, 65p. Technical rept. no. D228 100 008
Contract Nonr1670 00
Unclassified report

Descriptors: (*Helicopters, Human engineering), Display systems, Helicopters), Flight simulators, Instrument flight, Vertical indicators, Horizontal indicators, Cockpits, Ground position indicators, Flight instruments, Television display systems, Hovering.

Engineering testing and systems design are reported for the Research helicopter. This document is a collection of oral reports given to the JANAIR Committee in July 1963. A description of evaluative studies is presented with performance data and brief results and conclusions for the following projects: vertical display; navigation display map scales; and television flight displays. (Author)

AD-436 114 Div. 1, 22
OTS price $6.00

Aircraft Armaments, Inc., Cockeysville, Md.
A PROGRAM TO DETERMINE HIGH BLAST-INDUCED AIRLOADS AND STRUCTURAL RESPONSE OF LIFTING SURFACES.
Rept. for Apr 60-Mar 63,
by R. L. Jarvis, J. J. Kasper, R. R. Mills, Jr. and I. O. Wolf. Mar 64, 402p. Rept. no. ER2983
Contract AF33 616 7099, Proj. 1350, Task 135002
ASD TDR63 764, vol. 1 Unclassified report

Descriptors: (*Airframes, Blast), (*Aeroelasticity, Shock waves), Vulnerability, Rocket propelled sleds, Instrumentation, Aerodynamic loading, Airfoils, Jet bombers, Deformation, Failure (Mechanics).

High blast-induced airloads and the structural response of lifting surfaces are investigated for determining aircraft vulnerability and safety. Of major interest is the case where the primary structure of the lifting surface undergoes deformations of an inelastic nature. Structural response prediction methods, for completely elastic reponse conditions, are well documented and quite reliable. However, the methods of evaluating the structural response must be extended into the inelastic region and verified through the use of experimentally collected datat. The structural response of F-84 horizontal stabilizers mounted on a rocket sled and exposed to a high explosive blast was photographically recorded. (Author)

AD-436 594 Div. 1
OTS price $5.60

Tactical Air Command, Langley AFB, Va.
OPERATIONAL TEST AND EVALUATION F-105F TRAINING SUITABILITY TEST.
Apr 64, 54p.
TAC TR63 20 Unclassified report

Descriptors: (*Jet training planes, Acceptability), Jet fighters, Design, Feasibility studies, Take-off, Climbing, Radio navigation, Maintenance, Flight testing, Tests, Test methods, Mission profiles, Night flight, Nuclear weapons, Aerial warfare, Refueling in flight.

This test evaluated the F-105F aircraft in all phases of training, and in the operational role presently assigned to the F-105D. The F-105F Weapon System is virtually identical to the F-105D Weapon System. Being a two-place aircraft, the F-105F permits direct supervision, not previously possible, in the instrument and weapons system training environment. Less training will be required to increase pilot proficiency in weapon systems operation. Due to the limited visibility from the aft cockpit, the F-105F is not adaptable to all phases of the F-105 training program, however, its use in the other phases make it a valuable training vehicle. For those tactical missions requiring a high degree of pilot proficiency, the assistance provided by the additional crew member could increase the probability of mission accomplishment. (Author)

AD-436 702 Div. 1
OTS price $1.60

General Dynamics/Fort Worth, Tex.
WING LEADING EDGE -- INVESTIGATION OF RAIN DAMAGE ON,
by J. F. Hunter. 15 Apr 64, 15p. Rept. no. FGT2728
Contract AF33 657 11214
Unclassified report

Descriptors: (*Jet bombers, Wings), (*Wings, Raindrops), Damage, Airplane panels, Sandwich panels, Model tests, Shear stresses, Failure (Mechanics), Separation, Synthetic rubber, Plastic coatings, Performance (Engineering), Erosion.

AD-436 746 Div. 1, 9
OTS price $6.60

Boeing Co., Renton, Wash.
STATE-OF-THE-ART SURVEY FOR MINIMUM APPROACH, LANDING, AND TAKEOFF INTERVALS AS DICTATED BY WAKES, VORTICES, AND WEATHER PHENOMENA,
by W. J. Bennett. Jan 64, 67p. Document no. RD64 4
Contract FA WA4450, Proj. 101 25R
Unclassified report

Descriptors: (*Aviation safety, Vortices), (*Air traffic, Wake), Airports, Aviation safety, Wings, Ground effect, Take-off, Swept wings, Helicopters, Short take-off planes, Velocity, Meteorological parameters, Mathematical analysis, Attenuation, Separation, Approach, Aircraft landings, Reviews, Supersonic planes, Jet planes, Turbulence, Jet transport planes.

A study is made of the generation and decay of the wake behind an aircraft, both in free air and ground effect, and its effect on following

aircraft. An analysis is presented for both fixed- and rotary-wing aircraft which defines the wake movement with time and the wake-induced velocities. The wake due to the propulsion system is analyzed both for normal operation and reversed thrust, as well as for pure propulsion lift. The influence of atmospheric parameters such as wind, temperature, and turbulence is discussed as it applies to the generation and decay of the wake. (Author)

AD-436 815 Div. 1, 30
OTS price $6.60

Naval Ordnance Test Station, China Lake, Calif.
AN INVESTIGATION OF METHODS FOR DETERMINING THE VERTICAL VELOCITY OF AN AIRCRAFT,
by Ronald A. Erickson. Mar 64, 64p.
NOTS TP3293; NAVWEPS 8387
Unclassified report

Descriptors: (*Vertical indicators, Velocity), Analog computers, Accelerometers, Measurement, Radio altimeters, Acceleration, Doppler radar, Special purpose computers, Input-output devices, Programming (Computers), Height finding, Errors, Vertical recording systems.

The accuracy of the vertical velocity of an aircraft as determined from vertical acceleration from a vertical accelerometer, barometric altitude from a radar altimeter is not good enough for military aircraft fire-control systems. For military applications, vertical velocity can be computed to an estimated accuracy of +4 ft/sec from the proper combination of barometric altitude and vertical acceleration. Doppler vertical velocity and vertical acceleration can also be used in the proper combination to yield an acceptably low error in the computation. Gain in the feedback loop can be set low enough to loosely couple the doppler velocity yet still remove the accelerometer bias error. Adding doppler vertical velocity to the vertical acceleration and barometric altitude combination has no advantage over the use of the vertical acceleration and barometric altitude combination and is therefore not recommended. (Author)

AD-436 845 Div. 1
OTS price $3.60

General Mills Inc., Minneapolis, Minn.
DETERMINATION OF THE SHAPE OF A FREE BALLOON. THEORETICAL DEVELOPMENT,
by Justin H. Smalley. 2 Aug 63, 34p. Rept. no. 2421, SR1
Contract AF19 628 2783, Proj. 6665, Task 666501
AFCRL 63 951 Unclassified report

Descriptors: (*Balloons, Design), Reviews, Stresses, Configuration, Equations, Theory, Pressure vessels, Aerodynamic configurations.

A survey is presented of the literature on thin, flexible, pressure vessels. Equations for the stresses in an axi-symmetric balloon are determined. The equations are then rearranged to be most suitable for computation of shape. Derivation of the balloon design parameter sigma is presented. (Author)

AD-437 622 Div. 1
OTS price $3.60

Princeton Univ., N. J.
AN EXPLORATORY STUDY OF INSTRUMENT APPROACHES WITH STEEP GRADIENT AIRCRAFT,
by E. Seckel, J. J. Traybar and G. E. Miller.
Oct 63, 37p. Rept. no. AER630
Contract DA44 177tc834, Task 1D121401A14203,
ATRECOM TR63 28 Unclassified report

Descriptors: (*Approach, Helicopters), (*Instrument landings, Helicopters), All-weather aviation, Approach indicators, Glide path systems, Radio signals, Display systems, Airspeed indicators, Rate-of-descent indicators.

Flight tests were conducted to determine the influence of certain parameters and quickened cross-pointer presentations on instrument approaches with steep gradient aircraft. Approximately 50 hooded instrument approaches were flown using a single-rotor helicopter piloted by a highly experienced NASA test pilot. Standard flight instruments were used and the tracking presentation for the pilot consisted of an ILS type cross-pointer indicator. Parallel beam patterns as well as the standard angular, wedge-shaped ILS beam patterns were simulated by a tracking theodolite system coupled to the aircraft cross-pointer by a radio link. Numerous beam widths, glide slope inclination angles, and quickening inputs were investigated. The maximum glide slope inclination angles studied were in the 8- to 10-degree range because of operational limitations of the aircraft and task (30 knots minimum airspeed and 500 feet per minute maximum rate of descent). Parallel beam patterns (constant sensitivity) were preferred over the standard angular wedge-shaped beam patterns (sensitivity varying with range from transmitter). No significant improvements were obtained with the quickened presentation in preference to the pure displacement presentation. (Author)

AD-437 623 Div. 1, 27
OTS price $8.60

General Electric Co., Cincinnati, Ohio.
XV-5A LIFT FAN FLIGHT RESEARCH AIRCRAFT.
Quarterly technical progress rept. no. 8, 16 Aug-15 Nov 63.
31 Dec 63, 98p.
Contract DA44 177tc715
Unclassified report

Descriptors: (*Vertical take-off planes, Fans), (*Fans, Lift), Structural properties, Thrust reverse, Performance (Engineering), Ejection seats, Flight testing, Turbojet engines, Time, Tests, Stability, Control, Effectiveness, Guide vanes, Deflection, Airframes, Aeroelasticity, Elasticity, Materials, Metals, Thermodynamics, Air cooled, Air, Temperature, Aircraft engines, Reliability, Stresses.

The manufacture and acceptance testing of propulsion system was completed. Propulsion system support was expanded during the aircraft ground tests. Flight test program details and a revised program schedule were completed and submitted. Full scale wind tunnel test preparations are well underway with the necessary test hardware and instrumentation being manufactured. Static structural tests and ground resonance tests of the aircraft were completed. Numerous structural stress, and model test reports were completed and issued. Installation of all aircraft electrical and hydraulic components has been made in the simulator with approximately 30 hours operating time. Installation of systems is progressing on both aircraft with No. 1 aircraft 92% complete and No. 2 aircraft 94% complete. (Author)

AD-437 655 Div. 1, 9
OTS price $1.10

Giannini Controls Corp., Malvern, Pa.
MODEL FLY PROGRAM.
Monthly progress rept. no. 27 for Sep 63.
22 Oct 63, 6p.
Contract AF33 616 8260, Projs. 1367, 8219, Tasks 136713, 821901
Unclassified report

Descriptors: (*Scientific research, Research program administration), Documentation, Airplane models, Flight control systems, Fluids, Amplification, Aerodynamic characteristics.

AD-437 686 Div. 1
OTS price $12.50

General Dynamics/Fort Worth, Tex.
ANALYTICAL PREDICTION OF THE B-58A SPIN CHARACTERISTICS - PHASE II. CORRELATION OF ANALYTICAL MODEL SPIN PREDICTIONS WITH FREE FLIGHT MODEL TEST RESULTS,
by M. W. Bahnman and J. H. Brown. 1 Sep 63, 172p.
Rept. no. FZE4 059
Contract AF33 600 38975
Unclassified report

Descriptors: (*Jet bombers, Spin), Airplane models, Model tests, Angle of attack, Mathematical prediction, Aerodynamic characteristics, Sideslip, Wind tunnel models.

This spin investigation is composed of free-flight model spin-entry and developed-spin tests, static and rotary force-model wind-tunnel tests to extreme angles of attack and sideslip, and an analytical program for prediction of high angle of attack motion. The second phase uses final, low Reynolds number aerodynamic data and deals with the correlation of analytical predictions of model motion with free-flight model test results. The objective is to determine the accuracy of analytical predictions of the model motions at extreme angles of attack so as to establish the level of confidence to be placed in the prediction of full-scale airplane motion. The free-flight model test program consisted of spin-entry (catapult) tests and developed-spin (spin tunnel) tests. Time histories of the motion of a 1/40-scale dynamically-similar model of the B-58A were obtained from raw test data transmitted by NASA. From comparison of analytical predictions of model motion with experimental time histories, it is concluded that analytical predictions of stall and spin-entry motion are quite adequate and valid. The developed-spin predictions are less accurate than those for spin-entry. However, they are representative of the developed-spin motion and the general levels of periods and amplitudes of the oscillations are acceptable. (Author)

AD-437 691 Div. 1, 30
OTS price $19.75

Bell Aerosystems Co., Buffalo, N. Y.
STUDY OF REQUIREMENTS FOR VTOL RESEARCH SIMULATOR FOR THE STUDY OF CONTROL AND DISPLAY PROBLEMS,
by W. E. Powe, J. Burgess, R. Seguin, N. Carriero and G. Malecki. Apr 63, 334p. Rept. no. 2120 920002
Contract NOas57 836C
Unclassified report

Descriptors: (*Control simulators, Vertical take-off planes), (*Vertical take-off planes, Display systems), Design, Aerodynamic configuration, Aerodynamic characteristics, Research program administration, Performance (Human), Tracking, Short take off, Motion, Stability, Helicopters, Rotary wings, Tilt wings, Mathematic analysis, Simulation, Instrument panels, Cockpits.

AD-437 875 Div. 1
OTS price $5.60

Lockheed Aircraft Corp., Burbank, Calif.
FUSELAGE FAIL-SAFE DESIGN DATA AND BOMB RESISTANT ANALYSIS FOR THE SUPERSONIC TRANSPORT.
Quarterly rept. no. 1, 1 May-31 July 63,
by F. M. Mueller. 31 July 63, 52p. Rept. no. LR17128
Contract AF33 657 11460
Unclassified report

Descriptors: (*Stiffened cylinders, Stresses), (*Fuselages, Failure (Mechanics)), Titanium alloys, Steel, Supersonic planes, Pressurized cabins, Strain (Mechanics), Fatigue (Mechanics), Pressure vessels, Explosion effects, Test methods, Materials, Airframes, Vanadium alloys, Molybdenum alloys.

The major effort is to provide design data on the crack-stopping characteristics of hoops or straps on pressurized cylinders. Approximately 50 flat panels, 10 unstiffened cylinders and 36 stiffened cylinders (of 30-inch diameter) are to be tested with variations in hoop proportions and hoop and stiffener spacing. Half of the specimens are to be of titanium 8A1-1V-1Mo duplex annealed, and the other half of PH14-8 Mo SRH 1050 steel. In addition, exploratory studies will be conducted to investigate the problems of designing a bomb-resistant structure. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-435 117 Div. 2
OTS price $1.60

2nd Weather Wing, APO 633, New York.
OBJECTIVE FOG STUDY FOR HAHN AB, GERMANY, (OCTOBER THROUGH FEBRUARY),
by A. E. Stockel. 18 Mar 64, 10p.
Unclassified report

Descriptors: (*Fog, West Germany), Weather forecasting, Air mass analysis, Data, Germany.

AD-435 129 Div. 2
OTS price $7.60

Pneumodynamics Corp., Bethesda, Md.
CABLE-TOWED OCEANOGRAPHIC INSTRUMENTATION SYSTEM DETAILED DESIGN,
by S. M. Gay, Jr. and Francis Walters. Feb 64, 79p. TR 6691
Contract Nonr3201 00
Unclassified report

Descriptors: (*Underwater sound equipment, Towed bodies), (*Oceanographic vessels, Instrumentation), Towing cables, Design, Power supplies, Underwater sound, Velocity, Measurement, Modules (Electronic), Installation, Electronic equipment.

Salient features are described of a cable-towed oceanographic instrumentation system designed for the taking of sound-speed measurements simultaneously and continously at six depths, to a maximum depth of 5,000 feet from a vessel proceeding at 7 1/4 knots. A novel housing for the sound velocimeter, designed to minimize sound-speed measurement error due to towing speed, is described. The housing is used to prevent rotation of the cable. The equations for prediction of cable rotation are derived and measurement of the rotational characteristics of a double-armored cable are reported. Description is also given of the development of the electrical signal-transmission system, which incorporates a novel low-distortion amplifier. (Author)

AD-435 164 Div. 2, 13
OTS price $7.60

Virginia Engineering Experiment Station, Blacksburg, Va.
EVALUATION OF SOILS AND USE OF SOIL SURVEYS FOR ENGINEERING PURPOSES IN URBAN DEVELOPMENT,
by R. D. Krebs and J. H. Hunter. Oct 63, 78p.
FHA 723 Unclassified report

Descriptors: (*Soils, Urban areas), (*Sewage, Disposal), Sanitary engineering, Wastes (Sanitary engineering), Sewage, Mapping, Disposal, Absorption (Physical), Soil mechanics, Terrain, Geological survey, Drainage, Georgia, Tennessee.

AD-435 478 Div. 2
OTS price $2.60

Aerospace Information Div., Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE. COMPILATION OF ABSTRACTS FROM SOVIET LITERATURE.
Monthly progress rept. no. 42.
10 Apr 64, 23p.
AID P 64 19 Unclassified report

Descriptors: (*Upper atmosphere, Abstracts), USSR, Ionospheric disturbances, Ionospheric propagation, Solar radiation, Van Allen radiation belt, Cosmic rays, Atmospheric electricity, Polar regions, Solar flares, Satellites (Artificial), Density, Solar spectrum.

AD-435 579 Div. 2
OTS price $7.60

Florida State Univ., Tallahassee.
TROPICAL CONVECTIVE AND SYNOPTIC SCALE WEATHER SYSTEMS AND THEIR STATISTICAL CONTRIBUTION TO TROPICAL CLIMATOLOGY.
Final rept.,
by N. E. La Seur and M. Garstang. Mar 64, 71p.
Grants DA SIG36 039 62G23, DA AR049 092 63G23
Unclassified report

Descriptors: (*Meteorological parameters, West Indies), Climatology, Atmospheric motion, Measurements, Clouds, Tropical regions, Rainfall, Diurnal variations, Energy.

The purpose of the field program was to collect the observations necessary to make an integrated, intensive study of tropical weather processes in a selected region of the tropics. To achieve this, an observational program was set up to obtain measurements of the role and inter-relationship between turbulent scales of motion associated with the transfer of latent and sensible heat between earth-ocean and atmosphere, convective scale motions below and in the cloud layer and synoptic scale systems in the tropical atmosphere. Within the framework of climatological data existing in this region, these observations were made so that a unified and simultaneous study of the various scales of motion could be carried out; the role of the individual scales of motion delineated and the important interactions among the different scales of motion described. (Author)

AD-435 631 Div. 2
OTS price $1.60

Colorado State U., Fort Collins.
CUMULUS CONVECTION AND OROGRAPHIC CONVECTION CELLS.
Technical rept. no. 3, 1 June-30 Nov 63,
by Herbert Riehl. 30 Nov 63, 20p.
Contract DA36 039sc89080E, Proj. 1A0 11001B021 09
Unclassified report

Descriptors: (*Meteorological phenomena, Cumulus clouds), (*Air mass analysis, Meteorological satellites), Seasonal variations, Convection, Malaya, South Asia, Wind, Meteorological parameters, Weather forecasting.

Preliminary research in regard to Southeast Asia regions is described under two topics, (1) Onset of the Asiatic Summer Monsoon and (2) Studies of Monsoon Cloud and Weather Patterns. Calendar dates for the commencement of the SW monsoon continue for the years 1942 through 1949. Daily variation of the wind, rainfall, and pressure patterns have been analyzed from August 1961 through October 1961. TIROS III pictures and radiation data are assisting in understanding the weather developments for this period. The conventional data at 500 mb appears to show more character, than lower or higher levels, in relation to existing weather (i.e. rainfall). (Author)

AD-435 642 Div. 2, 25
OTS price $11.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
UNDERGROUND EXPLOSION WAVES,
by G. M. Lyakhov and G. I. Polrovskiy.
10 Feb 64, 151p.
FTD TT63 724 Unclassified report

Trans. from Vzryvnyye Volny v Gruntakh, 1962.

Descriptors: (*Wave transmission, Earth), Seismic waves, Shock waves, Propagation, Explosions, Underground explosions, Theory, Soils, Blast, Equations of state, Mathematical analysis.

This book gives briefly the fundamentals of the theory of waves generated in the ground when explosives are detonated. It has been established, that the sudden changes of the parameters of explosive waves, observed in the ground, are primarily the result of the change in air and water content in the ground pores. Negligible fluctuations of this trapped air and water can change the parameters of the waves many hundredfold. The results obtained permit us to study the total effect of the waves more thoroughly, to increase the effectiveness of blasting operations, and to more soundly implement the safety measures. The book is intended for engineers and scientific workers involved with explosive operations, questions involving the effect of an explosion, and the theory of explosion waves, and also for undergraduate and graduate students specializing in this area. (Author)

AD-435 736 Div. 2, 8
OTS price $12.00

Ionosphere Research Lab., Pennsylvania State U., University Park.
INVESTIGATION OF PHASE INTERACTION AS A MEANS FOR THE STUDY OF THE LOWER IONOSPHERE,
by S. Weisbrod. 1 Mar 64, 161p. SR 206
Contract AF9 628 3842; NSF Grant GP846
Proj. 8605, Task 860502
AFCRL 64 32 Unclassified report

Report on Ionospheric Research.

Descriptors: (*Ionospheric propagation, Electromagnetic wave reflections), Phase measurement, Radio waves, Radio transmission, Atmospheric refraction, Instrumentation, Wiring diagrams, Phase modulation, Amplitude modulation.

The research described is concerned with a new technique for the study of the lower ionosphere. This technique is based on the simultaneous observations of phase and amplitude wave interaction. The magnitude of the observed phase perturbation is on the order of 10-4 radians (approximately 20 seconds of arc). To measure, or even to detect, such minute changes in the phase of ionospherically reflected echoes, which are subject to rapid amplitude fading and phase tumbling, required the development of special techniques and instrumentation. The scheme is based on the extension of the Fejer pulse technique which has been used in the past by a number of investigators in the study of the amplitude interaction. The theory of interaction is extended and generalized by the introduction of the complex coefficient of interaction, which embodies both amplitude and phase effects. The experimental results are in very good qualitative agreement with the theoretical computations based on simple but realistic ionospheric models. On the average, below 75 or 80km., the phase perturbations, measured in radians, are stronger than the amplitude perturbations. (Author)

AD-435 811 Div. 2, 30
OTS price $2.60

Texas A and M Coll., College Station.
STUDIES OF SATELLITE METEOROLOGICAL DATA FOR LOWER MIDDLE LATITUDE WEATHER SITUATIONS.
Final rept.,
by Aylmer H. Thompson. Jan 64, 25p. Rept. no. R64 3F
Contract AF19 604 8450, Proj. 6698 and 285, Task 66982
AFCRL 64 239 Unclassified report

Descriptors: (*Meteorological data, Mexico gulf), (*Abstracts, Reports), Meteorological satellites, Meteorology.

Studies of weather phenomena are summarized of the region near the Gulf of Mexico in which these data were employed as primary information. The details of the studies have been presented in several Scientific Reports referenced in this paper. (Author)

AD-435 812 Div. 2
OTS price $7.60

Texas A and M Coll., College Station.
AN INVESTIGATION OF TIME VARIATIONS IN A SUBTROPICAL JET STREAM AND THE ASSOCIATED CLOUD PATTERNS AS SHOWN BY TIROS I,
by Peter F. Lester, Samuel J. Hall and Aylmer H. Thompson. Feb 64, 75p. SR7; R64 2T
Contract AF19 604 8450, Proj. 6698 and 285, Task 66982
AFCRL 64 238 Unclassified report

Descriptors: (*Jet streams (Meteorology), Mexico gulf), Meteorological data, Meteorological satellites, Clouds, Atmospheric sounding, Meteorology, Photographic analysis.

A cloud band along the south side of the subtropical jet stream over the Gulf of Mexico was pictured by the TIROS meteorological satellite on 5 April 1960. The subsequent development of this cloud band for a five-day period was pictured by regular TIROS observations. The TIROS data were combined with conventional surface and upper air data to obtain a more detailed analysis of the situation. The cloud band was shown to consist mainly of middle and high clouds. Cross section analysis supported the possible interrelationship of the cloud band, the so called 'jet front', and the jet stream. Support for the theory that the lifting occurs in the area of entrance on the south side of the jet stream was also found. A good fit with the jet stream model of Endlich and McLean was noted. (Author)

AD-435 822 Div. 2
OTS price $2.60

Texas A and M Coll., College Station.
INVESTIGATION OF A TIROS III PHOTOGRAPH OF THE FLORIDA PENINSULA TAKEN ON 14 JULY 1961,
by Darryl Randerson and Aylmer H. Thompson. Jan 64, 21p. SR 6; R64 4T
Contract AF19 604 8450, Proj. 6698 and 285, Task 66982
AFCRL 64 237 Unclassified report

Descriptors: (*Meteorological satellites, Photographic analysis), (*Thunderstorms, Florida), Clouds, Lakes, Atmospheric soundings, Temperature.

A 14 July 1961 TIROS photograph of the Florida Peninsula suggests that by early afternoon thunderstorm activity was concentrated along all coasts. There were indications that this peculiar distribution was related to the formation of convergence or activity lines along the coasts caused by surface heating over the interior and the development of weak sea breeze circulations along all coasts. This picture also shows the stabilizing influence of the larger lakes over the Peninsula, for example, Lake Okeechobee. (Author)

AD-435 823 Div. 2
OTS price $4.60

Texas A and M Coll., College Station.
INVESTIGATION OF RADIATION PATTERNS IN THE 8-12 MICRON RANGE AS OBSERVED BY TIROS III OVER THE CARIBBEAN SEA DURING THE PERIOD 20-21 JULY 1961,
by Paul I. Mohler and Aylmer H. Thompson.
1 Feb 64, 42p. SR 5; R64 5T
Contract AF19 604 8450, Proj. 6698 and 285, Task 66982
AFCRL 64 236 Unclassified report

Descriptors: (*Infrared radiation, Clouds), Cloud cover, Caribbean sea, Atmospheric temperature, Surface temperatures, Meteorological satellites, Weather forecasting, Air mass analysis, Atmospheric condensation, Meteorological charts.

Two cases of infrared radiation measurements in the 8-12 micron range are studied. The radiation readings are related to cloud patterns and surface temperatures in the Caribbean Sea and adjacent areas. These two cases demonstrate some of the synoptic uses and limitations of the radiation data for cloud detection and surface temperature determinations. The radiation data were found useful in determining areas of general cloudness. An attempt to relate the infrared radiation measurements to surface temperature suggested a close relation between the precipitable water content and the difference between actual and effective radiation surface temperatures. Determination of this relationship was hindered by the absence of a cloud-free area. (Author)

AD-435 824 Div. 2, 24
OTS price $6.60

Texas A and M Coll., College Station.
TIME CHANGES IN CLOUDS AS SHOWN BY TIROS OBSERVATIONS OVER THE GULF OF MEXICO AND CARIBBEAN SEA DURING THE PERIOD 18-23 JULY 1961,
by William P. Cramer and Aylmer H. Thompson.
1 Jan 64, 64p. SR 4; Ref. 64 1T
Contract AF19 604 8450, Proj. 6698; A&M Proj. 285, Task 66982
AFCRL 64 235 Unclassified report

Descriptors: (*Cloud cover, Meteorological satellites), Photographic reconnaissance, Photographic analysis, Air mass analysis, Weather forecasting, Atmospheric motion, Anticyclones, Meteorological parameters, Humidity, Photointerpretation, Meteorology.

A radical change in cloud cover occurred over the Gulf of Mexico between 18 and 20 July 1961. This development occurred when an easterly wave moved westward across the Caribbean Sea into the Gulf and combined with an upper trough of polar origin moving eastward through the lower United States. The super-position of these systems resulted in deepening of the combined system and development of an extensive cloud mass. The cloud mass gradually changed orientation. Analyses using conventional data and meteorological satellite data from TIROS III were used to identify and follow the above systems. Isopleths of relative humidity were used to identify moist air on constant pressure charts. Large values of relative humidity were not always a reliable indication of cloud cover. Use of satellite data improved synoptic continuity and called attention to cloud systems which could have gone undetected between widely spaced data-reporting stations. Examples of such uses are shown. More realistic analyses of conventional meteorological charts resulted from use of TIROS data. (Author)

AD-435 830 Div. 2
OTS price $5.60

Interagency Committee on Oceanography, Washington, D. C.
NATIONAL OCEANOGRAPHIC PROGRAM. PART I: SUMMARY. FISCAL YEAR 1965.
Mar 64, 54p.
ICO P 15 Unclassified report

Descriptors: (*Oceanology, United States Government), Research program administration, Federal budgets, Oceanographic vessels, Scientific research, Costs, Management engineering, Department of Defense, Naval research, Data processing systems, Coast Guard, Oceanographic equipments, Ships.

This summary of the National Oceanographic Program for FY 1965 has been prepared particularly for the U.S. Congress, as a background for their consideration of the President's budget transmitted to the Congress January 21, 1964. An account is given of the diverse ways in which the oceans contribute to the Nation's security and welfare, and an outline is presented of specific plans and the associated funding required to advance our understanding of the sea and to exploit this understanding. Also, details are provided of the steps being taken under Federal leadership to strengthen and coordinate this program with due regard for thrift in the use of both manpower and appropriations. (Author)

AD-435 854 Div. 2
OTS price $5.60

Navy Electronics Lab., San Diego, Calif.
MEASUREMENTS OF THERMAL STRUCTURE BETWEEN SOUTHERN CALIFORNIA AND HAWAII WITH THE THERMISTOR CHAIN,
by E. C. LaFond and A. T. Moore. 7 Feb 64, 53p.
NEL 1210 Unclassified report

Descriptors: (*Pacific Ocean, Bathy thermographs), Oceans, Temperature, Surface temperature, Measurement, Thermistors, Oceanology, Oceanographic data.

A study was made of the thermal structure of the upper 800 feet of the sea by towing the NEL thermistor chain in deep water between San Diego, California, and Honolulu, Hawaii. The median vertical (slope) in temperature sections proved to be 0 degress 16 min. and the 70-percentile (slope), 0 degrees 30 min., and the significant high frequency peaks in the power spectrum of isotherm depths are more numerous in the central part of the section between Hawaii and California. (Author)

AD-435 873 Div. 2
OTS price $26.00

Air Force Cambridge Research Labs., Bedford, Mass.
OZONESONDE OBSERVATIONS OVER NORTH AMERICA. VOLUME I.
Rept. for Jan-Mar 63,
ed by Wayne S. Hering. Jan 64, 526p.
Proj. 8631
AFCRL 64 30, vol. 1 Unclassified report

Descriptors: (*Ozone, Atmosphere), North America, Meteorological instruments, Meteorological balloons, Data, Tables.

A network of 11 ozonesonde stations was established in North America to provide high resolution observations of the vertical ozone distribution for a variety of research purposes. The resultant data will be published in a series

of volumes consisting of both graphical presentation of the ozone profiles and associated temperature and dew point profiles and a detailed tabulation of the ozone and radiosonde data. This first volume contains observations for the period January through March 1963 plus the results from a series of test flights conducted just prior to the start of the program. (Author)

AD-435 890 Div. 2
OTS price $7.60

Marine Lab., Univ. of Miami, Coral Gables, Fla.
MESOSCALE STUDIES OF INSTABILITY PATTERNS AND WINDS IN THE TROPICS.
Semi annual rept. no. 1, 1 May 63-30 Nov 63,
by Harold P. Gerrish and Homer W. Hiser.
Dec 63, 79p. Rept. no. 4
Contract DA36 039SC89111, Proj. 1A0 11001B021 09
Unclassified report

Descriptors: (*Meteorological phenomena, Tropical regions), Meteorological radar, Radar reflections, Atmospheric motion, Winds, Motion, Meteorological charts, Velocity, Clouds, Climatology, Rainfall, Radar images, Radar echo areas, Meteorology, Stability.

Case studies of 27 August 1962 and 30 August 1963 are used to compare echo motions derived from conventional PPI and CAPPI data, respectively, with winds aloft. Brief surveys are made on the trackable lifetime of echoes and the relation of low-cloud patterns to mesoscale features. A climatic rainfall study of South and South-Central Florida is presented with isohyetal analysis based on data from 80 stations. Finally, a comparison is made of concurrent pibal and rawin observations for Merida, Mexico. Aside from problems of continuity associated with manual data collection and typically small displacements of tropical echoes, results of echo motions using CAPPI data were encouraging enough to warrant additional study. (Author)

AD-435 980 Div. 2
OTS price $4.60

Valley Forge Space Technology Center, Philadelphia, Pa.
THEORETICAL CALCULATION OF CROSS-SECTIONS OF IMPORTANCE TO ATMOSPHERIC DEIONIZATION,
by C. W. Baulknight and M. H. Bortner. Jan 64,
48p. SR no. 3
Contract AF19 604 8820
AFCRL 64 142 Unclassified report

Descriptors: (*Recombination reactions, Atmosphere), (*Atmosphere, Recombination reactions), Ions, Gas ionization, Dissociation, Nitrogen, Oxygen, Probability, Hamiltonian, Upper atmosphere, Geophysics.

Ion-ion recombination reactions play a major role in atmospheric deionization. However, there are little or no data available on the rate constants for reactions of interest of this type. A program was, therefore, carried out to obtain order-of-magnitude values for rate constants for certain of these reactions. The technique used for these calculations was a curve-crossing technique similar to that used by Magee, but with certain modifications. It essentially involved the calculation of the Hamiltonian for the process, the use of this Hamiltonian in the calculation of the probabilities of transition at the curve-crossing points and the use of the probabilities in the calculation of the cross-sections and rate constants. The report also includes a discussion of methods which have been reported in the literature for calculations on the dissociative recombination type of reaction. (Author)

AD-436 026 Div. 2, 30
OTS price $23.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
MACHINE REDUCTION, COMPUTATION, AND ANALYSIS OF LIGHT CURVES OF ECLIPSING BINARY SYSTEMS,
by I. Jurkevich. 1 Apr 64, 474p. Rept. no. R64SD8
Unclassified report

Descriptors: (*Astronomy, Data processing systems), (*Binary stars, Data processing systems), (*Data processing systems, Astronomy), Light, Programming (Computers), Tables, Functions, Fourier analysis, Harmonic analysis, Matrix algebra, Mathematical analysis, Partial differential equations.

The purpose of the following work is to present an application of automatic computing techniques to the numerical treatment of observed light curves of eclipsing binary systems (EBS). The machine selected is an IBM 1620 general purpose data processing system. All computations discussed in this work were prepared in FORTRAN language and are adaptable with minor modifications to large machines such as IBM 7090 or 7094 data processing systems. This compatibility is desirable because, as mentioned in the main body of this work, certain computations, although capable of being explored with a 1620 system, are not ideally suited for it. This situation arises whenever the number of observations is so large as to lead to unreasonable computing times. Under such conditions the use of a large machine becomes much more economical. (Author)

AD-436 330 Div. 2
OTS price $3.60

Minnesota U., Minn.
THE MODULATION OF HEAVY NUCLEI IN THE PRIMARY COSMIC RADIATION,
by P. S. Freier and C. J. Waddington. Feb 64,
32p. Rept. no. TR CR70
Contract Nonr71019
Unclassified report

Descriptors: (*Cosmic rays, Intensity), High altitude, Balloons, Measurement, Photographic emulsions, Modulation, Alpha particles, Neutrons, Solar radiation, Nuclear particles, Geophysics.

The intensities of the primary cosmic ray heavy nuclei, $z \leq 3$, have been studied during several Forbush decreases. Fifteen values of the intensity were measured, using nuclear emulsion detectors flown during a balloon cosmic ray monitoring program. These values are those observed before, during or after four of the largest Forbush decreases that occurred in the last solar cycle. Examination of this data, together with that previously available in the literature suggests that the heavy nuclei are modulated in a similar manner to the alpha particle and protons of the primary radiation, showing that the modulation process is not a strongly charge dependent one. (Author)

AD-436 543 Div. 2
OTS price $1.60

Weather Bureau, Washington, D.C.
EXPERIENCE WITH SHORT RANGE WEATHER PREDICTION ON THE BASIS OF THE SOLUTION OF A COMPLETE SYSTEM OF THERMOHYDRODYNAMIC EQUATIONS (Opyt Kratkosrochnogo Prognoza Pogody Na Osnove Reshenila Polei Sistemy Uravnenii Termogidrodinamiki),
by S. A. Bortnikov, tr. by Irene A. Donehoo.
Apr 63, 14p.
WB DC T96 Unclassified report

Trans. from Meteorologiia i Gidrologiia, No. 11, pp. 12-19, 1962.

Descriptors: (*Weather forecasting, Equations), Barometric pressure, Air mass analysis, Heat.

AD-436 545 Div. 2
OTS price $13.00

Marine Lab. Univ. of Miami, Coral Gables, Fla.
A REPORT OF DATA OBTAINED IN FLORIDA STRAITS AND OFF THE WEST COAST OF FLORIDA JANUARY - JUNE 1963.
Jan 64, 183p. Rept. nos. 64 1, ML64032
Contract Nonr4008 02
Unclassified report

Descriptors: (*Marine geology, Oceanographic data), (*Atlantic ocean, Florida), Sampling, Sea water, Chemical analysis, Salinity, Bathythermograph data, Tables, Data processing systems, Oceanographic equipment.

The data presented herewith were collected during the first half of 1963 on ten cruises with the R/V GERDA and nine cruises with the M/V MISS FLETA in Florida Straits and the eastern part of the Gulf of Mexico. The data were obtained for studies of the oceanographic conditions prevailing in Florida Straits and adjacent waters, with particular regard to the kinematics of the water movements and also to the physical environment of the shrimp population inhabiting the region of the Tortugas Shelf. The tracks of the vessels and the positions at which observations were made are shown in charts immediately preceding the list of oceanographic station data relating to each cruise. (Author)

AD-436 550 Div. 2
OTS price $1.60

Air Weather Service, Scott Air Force Base, Ill.
AN OBJECTIVE AID FOR FORECASTING STRATUS AND FOG AT ROBINS AFB, GEORGIA,
by Hiram E. Penland. 17 Feb 64, 10p.
Unclassified report

Descriptors: (*Weather forecasting, Georgia), Meteorological phenomena, Stratus clouds, Fog, Ceiling, Terrain.

AD-436 555 Div. 2
OTS price $2.60

Weather Bureau, Washington, D. C.
ON THE THEORY OF PRESSURE WAVES IN A BAROCLINIC ATMOSPHERE (K Teorii Voln Davleniia v Baroklinnoi Atmosfere),
by S. A. Mashkovich, tr. by Irene A. Donehoo.
Mar 63, 30p.
WB DC T95 Unclassified report

Trans. from Trudy Tsentral'nyi Institut Prognozov, Moscow, Issue no. 111, pp. 13-28, 1961.

Descriptors: (*Atmospheric motion, Analysis), (*Air mass analysis, Atmosphere models), Barometric pressure, Theory, Energy, Temperature, Stability, Polynomials, Propagation, Turbulence, Wave transmission.

The development of waves imposed on the baroclinic zonal flow is investigated. The problem is solved with a numerical method for four and ten-level atmospheric models. The results obtained are used for investigating the stability of motion, for determining the character of wave evolution with a different vertical structure of a disturbance at an initial moment, and for the evaluation of transformation of energy. The calculated results demonstrate the relationship between the stability of waves of different magnitudes on the vertical velocity profile of the basic flow and the stratification of the atmosphere. (Author)

AD-436 556 Div. 2
OTS price $3.60

Weather Bureau, Washington, D. C.
RELATIONSHIPS BETWEEN THE ELEMENTS OF LARGE-SCALE ATMOSPHERIC MOTIONS AND CERTAIN PROGNOSTIC CONSEQUENCES (Sootnosheniia Elementov Krupnomashtabnykh Atmosfernykh Dvizhenii i Nekotorye Prognosticheskie Sledstviia),
ed. by M. I. Iudin, tr. by Irene A. Donehoo.
Feb 63, 37p.
WB DC T94 Unclassified report

Trans. from Koordinatsionnaia Komissiia po Chislennym Metodam Prognoza. Materialy Soveshchaniia, Leningrad, Gidrometeor. Izdat., pp. 5-24, 1961.

Descriptors: (*Atmospheric motion, Dynamics), (*Meteorological phenomena, Equations), Meteorological parameters, Air mass analysis, Heat, Velocity, Equations of state, Linear systems, Stability.

A linearized system of equations on the dynamics of the atmosphere is examined. The relationships of spectral components of the basic meteorological elements are found as well as the motions on a vertical scale depending on the magnitudes of horizontal scale, of the parameter of stability, characteristic speed and latitude. The relationships between components in the equations for the dynamics of the atmosphere are evaluated. Conditions are shown whereby there occurs a rearrangement of meteorological fields in connection with rapid wave motions. (Author)

AD-436 557 Div. 2
OTS price $1.10

Weather Bureau, Washington, D. C.
DEFINING THE MINIMUM TEMPERATURE VALUES IN THE ANTARCTIC (Utochnenie Znachenii Minimal'noi Temperatury v Antarktike),
by E. M. Dobryshman, tr. by Irene A. Donehoo.
Nov 62, 4p.
WB DC T93 Unclassified report

Trans. from Meteorologiia i Gidrologiia, 8:33, 1962.

Descriptors: (*Arctic regions, Temperature), (*Low-temperature research, Arctic regions), (*Meteorological parameters, Arctic regions), Snow, Mathematical analysis, Meteorology, Thermal radiation.

AD-436 603 Div. 2
OTS price $5.60

Air Weather Service, Scott Air Force Base, Ill.
ESTIMATED FREQUENCIES OF SPECIFIED CLOUD AMOUNTS WITHIN SPECIFIED RANGES OF ALTITUDE,
by Irving Solomon. Apr 63, 53p.
AWS TR167 Unclassified report

Descriptors: (*Cloud cover, Distribution), Clouds, Graphics, Meteorological charts, Meteorological parameters, Climatology, Analysis, Experimental data, Storms, Detection, Weather forecasting, Infrared detectors, Meteorological phenomena.

This study is designed to provide military planners, design engineers, and AWS personnel who support them, with estimates of the frequencies with which specified cloud amounts will be

encountered within specified altitude ranges. The information is shown by isopleths on Northern Hemisphere base maps for the midseason months. These data will furnish inputs into the strategic planning of environmental support to a system or an operation, for example, in selecting design criteria for equipment, determining the feasibility of an operation, and establishing long-range operational plans. The tactical, or short-range, planning should be based on synoptic weather forecasts which give go/no-go advice. (Author)

AD-436 607 Div. 2
OTS price $1.60

Army Polar Research and Development Center, Fort Belvoir, Va.
U. S. ARMY RESEARCH AND DEVELOPMENT PROGRAM-GREENLAND, 1964.
1 Mar 64, 14p.
Unclassified report

Descriptors: (*Polar regions, Scientific research), (*Research program administration, Greenland), Army research, Arctic regions.

AD-436 638 Div. 2
OTS price $2.60

Ohio State Univ., Columbus. Research Foundation.
ACCURACY OF MEAN GRAVITY ANOMALIES OBTAINED FROM POINT AND PROFILE MEASUREMENTS,
by Helmut Moritz. Dec 63, 28p. Rept. nos. 29, SR4
Contract AF19 628 2771, Proj. 7600, Task 760002
AFCRL 64 132 Unclassified report

Descriptors: (*Gravity, Anomalies), Numerical methods and procedures, Statistical functions, Least squares method, Errors, Measurement, Integration, Statistical analysis, Programming (Computers), Tables, Mathematical prediction, Analysis of variance, Geodesy.

Mean gravity anomalies for a certain rectangular area (block) can be computed from observed point or profile gravity values using some interpolation method (e.g., representation or least squares interpolation). If the covariance function of the gravity anomalies is known and the interpolation method is specified, then the accuracy (standard error and error covariance) of the mean anomalies can be computed without any additional numerical data. The formulas for this purpose are evaluated numerically for different sizes of blocks and different interpolation methods using an estimate for the covariance function. The integrals involved are approximated by summations performed by a high-speed computer. The results show the accuracies obtainable with a given observational material, by different interpolation methods. They are useful for numerical studies on the error propagation in the computation of gravimetric quantities (e.g., geoid undulations). (Author)

AD-436 708 Div. 2, 1
OTS price $1.60

Weather Wing (4th) Colorado Springs, Colo.
AN OBJECTIVE AID FOR FORECASTING CEILINGS AND VISIBILITIES AT SIOUX FALLS (FOSS FIELD) S. DAKOTA,
by Thomas H. Simmonds. Mar 64, 11p.
4WW TP64 6 Unclassified report

Descriptors: (*Weather forecasting, Ceiling), (*Terminal flight facilities, Weather forecasting), Visibility.

Forecasting the occurrence of operational critical values of ceilings and/or visibilities presents a major problem at Sioux Falls (Foss Field). This investigation was conducted to develop objective aids for forecasting such critical values. (Author)

AD-436 725 Div. 2
OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
RESEARCH DIRECTED TOWARD THE USE OF SYNOPTIC RADAR OBSERVATIONS IN THE INTERPRETATION OF SATELLITE CLOUD OBSERVATIONS.
Technical progress rept. no. 1, 1 Sep-31 Dec 59, by Myron G. H. Ligda. 14 Jan 60, 14p.
Contract AF19 604 5982, SRI Proj. 2986
Unclassified report

Descriptors: (*Clouds, Meteorological radar), (*Meteorological radar, Radar stations), Photographic analysis, Air Defense Command, Aerial photography, Radar stations, Atmospheric precipitation, Plan position indicators, Radar echo areas.

Twenty-five Air Defense Command Radar sites are being contracted for participation in the radarscope photography program. Crews are being indoctrinated and film and equipment distributed. An additional list of Weather Bureau and research radar sites in the United States and overseas Air Force sites which have been asked to participate is included. Radarscope photographs from Weather Reconnaissance flights of the 55th Weather Reconnaissance Squadron will also be available. Nineteen completed ground radar composites are shown. The possibility of less widespread precipitation areas than generally believed is indicated. Possible satellite cloud observation interpretation and transmission schemes are briefly noted. It is concluded that the augmented radar coverage affords good chance of success in achieving simultaneous radar satellite observations of weather systems. (Author)

AD-436 830 Div. 2
OTS price $2.60

Geotechnical Corp., Garland, Tex.
SPECTRAL ANALYSIS OF SEISMIC NOISE AT THE ENIWETOK E-1 WELL, PARRY ISLAND, ENIWETOK ATOLL, MARSHALL ISLANDS, PACIFIC OCEAN.
10 Mar 64, 22p. Rept. no. TR64 17
Contract AF33 600 43369
Unclassified report

Report on Proj. VT/1139.

Descriptors: (*Seismic waves, Pacific Ocean Islands), Noise, Background, Velocity, Analysis.

The power spectral density functions of seismic background noise were analyzed from several depths in the Eniwetok E-1 Well, Parry Island, Eniwetok Atoll, Marshall Islands. The theory of power spectra is discussed together with its application to the study of seismic background noise. Results obtained show that the noise recorded by a vertical-motion seismometer is due to Rayleigh waves, of fundamental and higher modes. (Author)

AD-436 835 Div. 2
OTS price $2.60

Kiruna Geophysical Observatory (Sweden).
DEPENDENCE OF AURORAL ZONE SATELLITE SCINTILLATION ON GEOMAGNETIC ACTIVITY,
by Ludwik Liszka. 16 Jan 64, 22p. Rept. no. SR3
Contract AF61 052 678
AFCRL 64 267 Unclassified report

Descriptors: (*Aurorae, Terrestrial magnetism), Brightness, Spacecraft, Diurnal variations,

Instrumentation, Radio waves, Illumination, Magnetic storms.

The dependence of auroral zone satellite scintillation on geomagnetic activity is discussed. It is shown that the scintillation phenomenon depends both on the time of observation and on magnetic activity, so that the scintillation index S has to be considered as a function of two variables: the geomagnetic K-index and the time of observation. The shape of this function of two variables may be explained by assuming diurnal changes in the scintillation rate spectrum. (Author)

AD-436 849 Div. 2
OTS price $1.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE UNIVERSITY OF ILLINOIS RADIO TELESCOPE.
Progress rept. no. 19, 1 Jan-31 Mar 64,
by G. C. McVittie and G. W. Swenson, Jr. 8 Apr 64, 8p.
Contract Nonr183422
Unclassified report

Descriptors: (*Radio astronomy, Telescopes), (*Telescopes, Astronomical observatories), Instrumentation, Maintenance, Mapping.

AD-437 135 Div. 2
OTS price $5.60

Oklahoma Univ., Research Inst., Norman.
SOME CHARACTERISTICS OF DENSITY DISTRIBUTION AS INFERRED FROM WIND MEASUREMENTS MADE BY THE METEOROLOGICAL ROCKET NETWORK,
by Donald Ray Thornley. Feb 64, 56p. SR2, 1357 2
Contract AF19 628 489, Proj. 8624, Task 862402
AFCRL 64 124 Unclassified report

Descriptors: (*Wind, Atmospheric sounding), (*Atmosphere, Density), Atmospheric temperature, Measurement, Barometric pressure, Hydrostatic pressure, Data, Sounding rockets.

Wind observations from the Meteorological Rocket Network are applied to the investigation of the distribution of density and the relationship between the distribution of density and the distributions of temperature and pressure to 65 kilometers altitude. The results of applying these wind data to this problem are analyzed from both physical and statistical viewpoints. These wind data depict the known features of the density field and suggests that a hitherto unsuspected region of temperature control exists between 20 and 33 kilometers altitude. (Author)

AD-437 146 Div. 2
OTS price $5.60

Raven Industries, Inc., Sioux Falls, S. Dak.
LIGHT WINDS IN THE STRATOSPHERE (18 TO 24 KM.) OVER THE UNITED STATES OF AMERICA,
by E. M. Frisby, R. Engel and J. Mechels.
June 64, 59p. Rept. no. 1064
Contract Nonr434700
Unclassified report

Descriptors: (*Wind, Stratosphere), Gusts, Atmospheric motion, United States, Tables, Data, Meteorological charts.

AD-437 149 Div. 2, 25
OTS price $1.60

Kiruna Geophysical Observatory (Sweden).
AURORAL ZONE FARADAY ROTATION STUDIES,
by Ludwik Liszka. 30 Dec 63, 17p. Rept. no. SR2
Contract AF61 052 678
AFCRL 64 266 Unclassified report

Descriptors: (*Aurorae, Magnetic fields), (*Light, Rotation), Terrestrial magnetism, Ionosphere, Satellties (Artificial), Analysis, Electrons, Sweden.

The analysis of 20 month's Faraday rotation observations made at Kiruna Geophysical Observatory was carried out with emphasis on special properties of the auroral zone F-region, especially the geomagnetic field and variations in the total electron content. It was found that the direction of the horizontal component of the geomagnetic field in the F-region differs by about 6 degrees from that extrapolated from the components at ground level. Increases of the rate of Faraday rotation observed in auroral zone were explained in terms of large horizontal variations of the total electron content. The amplitude of these variations is about one order of magnitude larger than observed at middle latitudes. (Author)

AD-437 198 Div. 2
OTS price $1.60

Radio Observatory Calif. Inst. of Tech., Pasadena.
OWENS VALLEY RADIO OBSERVATORY. 1. ON THE LINEAR POLARIZATION OF THE RADIATION FROM RADIO SOURCES,
by G. A. Seielstad, D. Morris and V. Radhakrishnan.
1964, 17p.
Contract Nonr22019
Unclassified report

Descriptors: (*Extraterrestrial radio waves, Polarization), Galaxies, Measurement, Radio astronomy, Magnetic fields.

AD-437 199 Div. 2
OTS price $1.10

Radio Observatory Calif. Inst. of Tech., Pasadena.
OBSERVATIONS OF THE OWENS VALLEY RADIO OBSERVATORY. 2. DIRECTION OF THE GALACTIC MAGNETIC FIELD IN THE VICINITY OF THE SUN,
by D. Morris and G. L. Berge. 1964, 7p.
Contract Nonr22019
Unclassified report

Descriptors: (*Magnetic fields, Galaxies), Planetary atmospheres, Tables, Rotation, Solar atmospheres, Measurement.

AD-437 204 Div. 2
OTS price $1.60

Oregon State Univ., Corvallis.
SURFACE TEMPERATURE AND SALINITY OBSERVATIONS AT SHORE STATIONS ON THE OREGON COAST FOR 1962,
by Robert Still, Bruce Wyatt and Norman F. Kujala, ed. by Elizabeth Strong. Oct 63, 17p.
Rept. no. DR11, Ref. no. 63 27
Contract Nonr128610, Proj. NR083 102
Unclassified report

Descriptors: (*Sea water, Pacific Ocean), (*Pacific Ocean, Sea water), (*Oceanographic data, Pacific Ocean), Temperature, Salinity, Surfaces, Tables, Oregon.

Where possible, sampling sites were selected at points exposed to open ocean effects. Temperature values were read to the nearest 0.1 C, but are considered accurate to ±0.2 C. Salinity values determined by titration are believed to be accurate to ±0.04%; the accuracy of values obtained from hydrometer readings is not known, but is probably ±0.5%. The northern portion of the coast (Columbia River Lightship to Otter Rock) showed strong influence of the Columbia River. Summer samples were higher in temperature and lower in salinity than the coastal average. Data from Seaside are selected to illustrate the

characteristics of this area. The central portion of the coast (Yachats to Humbug Mountain) was the region most influenced by upwelling. Low temperature and high salinity in summer were most marked at Humbug Mountain; data from this station are plotted. The most southerly stations (Brookings and Crescent City) were warmer than the other stations and the salinities were average or low; Brookings data are shown. (Author)

AD-437 214 Div. 2
OTS price $3.60

California Inst. of Tech., Pasadena, Calif.
OBSERVATIONS OF THE OWENS RADIO OBSERVATORY. THE SPECTRA OF NON-THERMAL RADIO SOURCES,
by Kenneth I. Kellermann. 1964, 33p.
Contract Nonr22019
Unclassified report

Descriptors: (*Radio astronomy, Galaxies), (*Radio interferometers, Measurement), Synchrotrons, Sources, Radio waves, Bessel functions, Tables.

The spectra of most nonthermal sources can be closely represented by a simple power law of the form. The distribution of spectral indices for the sources away from the galactic plane is sharply peaked about a median value of -0.76, while the sources near the plane have a considerably wider dispersion of indices. The small-diameter, relatively weak souces tend to have relatively flat spectra. The most luminous sources, with high surface brightnesses, have normal spectra at decimeter wavelengths but are considerably flatter at meter wavelengths, suggesting that they are younger sources where equilibrium between the rate of injection of relativistic electrons and the rate of radiation loss has not yet been established. The similarity of the spectra among the extragalactic sources and the surprising absence of any sources with very steep spectra is discussed and it is suggested that these may be understood if intergalactic space provides a common, continuing source of relativistic particles for all extragalactic sources. (Author)

AD-437 226 Div. 2
OTS price $3.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
MOLECULAR OPTICAL THICKNESS OF LOW-DENSITY MODELS OF THE ATMOSPHERE OF MARS,
by E. L. Gray and K. L. Coulson. Mar 64, 32p.
Rept. no. R64SD21
Unclassified report

Descriptors: (*Mars, Atmosphere), (*Atmosphere, Mars), (*Molecules, Thickness), (*Models (Simulations), Density), Scattering, Volume, Optical properties, Functions, Surfaces, Pressure, Energy, Equations, Tables, Solar radiation, Intensity.

Values of volume scattering coefficient and normal optical thickness for the revised estimates of the Martian atmosphere are given, as a function of altitude above the planetary surface, for eight selected wavelengths from 2500A to 10,000A. Four models of the Martian atmosphere, as given by the Jet Propulsion Laboratory, are used, the surface pressure for the models being 11 mb. (2 models), 15 mb., and mb. Comparisons with the previous higher-density atmospheric models for Mars, and with the U. S. Standard Atmosphere, are shown, and the values of optical thickness are used to compute the energy directed outward from the top of a Rayleigh atmosphere on Mars. The computations show that the normal optical thickness is lower for the new models than for the previous models by approximately the ratio of the surface pressures. (Author)

AD-437 264 Div. 2
OTS price $12.00

RAND Corp., Santa Monica, Calif.
HABITABLE PLANETS FOR MAN,
by Stephen Dole. Mar 64, 170p. Rept. no. R414PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Planets, Ecology), Temperature, Light, Gravity, Atmospheric temperature, Water, Astronomical data.

AD-437 327 Div. 2, 25
OTS price $2.60

Geophysical Inst., Univ. of Alaska, College.
RESEARCH ON RADIO-WAVE INTERACTION IN ALASKA.
Final rept., 1 July 61-31 Dec 63,
by W. L. Flock. Jan 64, 22p. Rept. no. 148
Contract AF19 604 8833, Proj. 8653, Task 865305
AFCRL 64 61 Unclassified report

Descriptors: (*Radio waves, Alaska), (*Detection, Analysis), Antennas, Phased arrays, Electric fields, Intensity, Absorption, Noise (Radio), Modulation.

In radio-wave interaction studies in Alaska, cosmic noise has been used in place of a wanted wave of local origin. The available theories are unable to explain the values of cross modulation observed. The results are more nearly explained by Huxley's theory of 1953 than by Bailey and Martyn's theory of 1934. Tests employing separate antenna arrays, for the disturbing wave and for the wanted wave, are needed to more completely evaluate the capability of the technique. (Author)

AD-437 330 Div. 2
OTS price $6.60

Lockheed Missiles and Space Co., Palo Alto, Calif.
SUB ELF GEOMAGNETIC FLUCTUATIONS. VOLUME II. STATISTICAL STUDIES OF HYDROMAGNETIC EMISSIONS.
Final rept.,
by R. C. Wentworth. 26 Dec 63, 70p. Rept. no. 8 08 64 1, vol. 2
Contract AF19 628 462, Proj. 8653
Unclassified report

Descriptors: (*Magnetohydrodynamics, Ionosphere), Extremely low frequency, Magnetic fields, Attenuation, Terrestrial magnetism, Electron density, Exosphere, Magnetic storms, Statistical analysis.

An empirical formula giving attenuation as a function of F2 peak ion density and hydromagnetic wave frequency has been applied to a nine-month data sample of hydromagnetic emissions (quasi-sinusoidal oscillations of the earth's magnetic field in the frequency interval around 1 cps). Under the hypothesis that these signals are attenuated as they propagate downward through the ionosphere as hydromagnetic waves, the amplitude and frequency spectrum above the ionosphere at middle latitudes has been deduced. (Author)

AD-437 332 Div. 2
OTS price $9.10

Lockheed Missiles and Space Co., Palo Alto, Calif.
SUB ELF GEOMAGNETIC FLUCTUATIONS. VOLUME I.

FREQUENCY-TIME CHARACTERISTICS OF HYDROMAGNETIC EMISSIONS.
Final rept.,
by Lee Tepley, R. C. Wentworth and K. D. Amundsen.
26 Dec 63, 10p. Rept. no. 8 08 64 1, vol. 1
Contract AF19 628 462, Proj. 8653
Unclassified report

Descriptors: (*Terrestrial magnetism, Measurement), Magnetometers, Extremely low frequency, Pacific Ocean, Magnetic storms.

Results are presented of recent measurements of hydromagnetic emissions at four Pacific Ocean stations widely separated in both latitude and longitude. The signals are almost always observed simultaneously at the four locations. The repetition frequency of the emission fine structure is found to be highly regular and is the same at all stations for any given hm emission event. The structural elements are observed simultaneously at stations in the same hemisphere, but the elements are found to be alternately spaced (180 out of phase) in emissions observed simultaneously at stations on opposite sides of the equator. Hence, energy is being received periodically and alternately in the northern and southern hemisphers. The result is applied to the evaluation of three recently proposed models for the generation of hm emissions; two of the three models are immmediately rejected. It is also observed on occasion that the fine-structure repetition-frequency ehibits the presence of a harmonic. The effect, referred to as 'structure-doubling; is tentatively interpreted as resulting from a super-position of signals from opposite hemispheres. (Author)

AD-437 483 Div. 2
OTS price $2.60

Travelers Research Center, Inc., Hartford, Conn.
(No title).
Monthly progress rept. for Mar 64.
Mar 64, 24p.
Contract Cwb10704
Unclassified report

Descriptors: (*Weather forecasting, Programming (Computers)), Research administration program, Tables, Statistical analysis, Probability, Mathematical prediction.

AD-437 484 Div. 2
OTS price $2.60

Air Weather Service, Scott AFB, Ill.
FORECASTING NIGHTTIME STRATUS AT HAMILTON AIR FORCE BASE FOR THE MAY-SEPTEMBER SEASON OF 1962,
by Andrew W. Weston. Jul 63, 27p.
Unclassified report

Descriptors: (*Clouds, Mathematical prediction), Weather forecasting.

The study is limited to the months of July, August, and September; and to ceilings less than 1500 feet. It does not include a procedure for forecasting the occurence-height and the lowest-height, or a procedure for forecasting the occurence time. The accuracy is not great enough to excite forecaster interest. (Author)

AD-437 506 Div. 2
OTS price $2.60

Instituto Geofisico del Peru (Lima).
PRELIMINARY MEASUREMENT OF H-ALPHA FLARE SPECTROGRAMS,
by Mutsumi Ishitsuka, Osamu Takahashi, Francisco Dominguez Vigo, Wilma Gonzales de Dominguez and Enrico Mattievich. Feb 63, 22p.
Contract AF49 638 637
Unclassified report

Descriptors: (*Solar flares, Analysis), Alpha spectra, Instrumentation, Hydrogen, Line spectrum, Spectrophotometers, Photographic film, Spectrographic cameras, Measurement, Curved profiles.

A spectrograph for observing solar flare spectra is being built. With the spectrograph, twenty two spectrograms were taken successively with short time intervals, in a narrow spectral region centered in the gydrogen H-alpha line, throughout a solar flare event detected on September 7, 1962. Six of those spectrograms were traced with a microphoto meter, hence the profiles obtained shown in this note. On the other hand, three spectrograms covering the same spectral region, obtained from the normal region of the sun, were traced with the microphotometer. The resultant observed profile was compared with the profile mentioned on the Utrecht Atlas, for the purpose of estimating roughly the certainty of the obtained spectrograms. The existence of considerable stray light in the spectrograph was also deuduced. The ratio of the equivalent width of H-alpha line in the normal observed profile to that of the Utrecht profile amounted to 0.80. (Author)

AD-437 507 Div. 2
OTS price $3.60

Instituto Geofisico del Peru (Lima).
ON THE CENTER-LIMB EFFECT OF SOLAR FLARE AREA,
by Osamu Takahashi. 1962, 40p.
Contract AF49 638 637
Unclassified report

Descriptors: (*Solar flares, Analysis), Distribution, Instrumentation, Optical equipment, Collimators, Diffraction gratings, Mirrors, Lenses, Distortion, Alpha spectra, Hydrogen.

The visual flare area has been corrected by a factor of sec o for real flare area. As the result of this correction, however, great discrepancy was brought into the distribution of flare area with respect to central distance on disk, and this discrepancy has been expalined as due to the flare height. This paper gives an actual proof of the existence of two different parts in the foreshortening effect of flare visual area and then gives the normalized correction of flare area, from the distribution of the flare counted number with respect to the central distance on disk. These two different parts are the well-know geometrical distorsion and the vanishing effect near the limb. (Author)

AD-437 508 Div. 2
OTS price $3.60

Instituto Geofisico del Peru, Lima.
SPECTROPHOTOMETRIC OBSERVATIONS OF SOLAR FLARES (PART I) RESULTS FROM THE VISUAL OBSERVATION OF SOLAR ACTIVITY (PART II).
by Mutsumi Ishitsuka. Jul 63, 37p.
Contract AF49 638 637
Unclassified report

Descriptors: (*Solar flares, Measurement), Solar disturbances, Analysis, Electric fields, Spectrophotometers, Sunspots, Instrumentation, Photometers, Light.

AD-437 509 Div. 2
OTS price $1.60

Instituto Geofisico del Peru, Lima.
STATISTICS OF SOLAR FLARES. PART I,
by Osamu Takahashi. 1962, 19p.
Contract AF49 638 637
Unclassified report

Descriptors: (*Solar flares, Statistical analysis), Sunspots, Hydrogen, Alpha spectra, Instrumentation, Statistical distributions, Frequency.

The main purpose of this note is to provide additional and more detailed information on various characteristics of solar flares, by means of statistical methods, to help in a better theoretical understanding of them. The solar flare's lifetime, area, H-alpha width, development curve, associated filament activation and associated sunspot group characteristics are all analyzed for each of 685 flares observed. Correlation of these parameters with one another and with flare importance and solar activity is shown, as well as the frequency distribution. (Author)

AD-437 656 Div. 2
OTS price $3.60

Meteorology International, Monterey, Calif.
SCALE-AND-PATTERN SPECTRA AND DECOMPOSITIONS,
by Manfred M. Holl. 1 Nov 63, 31p. Rept. no. TM3
Contract N228 62271 60550, Proj. M-109
Unclassified report

Descriptors: (*Meteorological phenomena, Fourier analysis), Analog systems, Meteorological charts, Operators (Mathematics), Geophysics, California, Mathematical models.

AD-437 675 Div. 2, 12, 15
OTS price $9.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
THE TWO VARIABLE EXPANSION PROCEDURE FOR THE APPROXIMATE SOLUTION OF CERTAIN NON-LINEAR DIFFERENTIAL EQUATIONS,
by J. Kevorkian. 3 Dec 62, 119p. Rept. no. SM42620
Grant AF AFOSR62 256
Unclassified report

Descriptors: (*Differential equations, Sequences), (*Celestial mechanics, Perturbation theory), (*Perturbation theory, Differential equations), Satellites (Artificial), Damping, Series, Oscillation.

A method is presented for deriving the asymptotic representation valid for large times for the motion of a particle under the influence of a predominantly linear restoring force and small non-linear perturbations. It is shown that such an asymptotic representation must be a function of two time variables in order to depict the behavior of the solution. The basic ideas are explained by the liberal use of simple examples, and the method is also applied to two idealized problems in celestial mechanics. (Author)

AD-437 784 Div. 2
OTS price $3.60

Acoustics and Seismics Lab., Univ. of Michigan, Ann Arbor.
INVESTIGATION OF AUDITORY DISCRIMINATION OF SEISMIC SIGNALS FROM EARTHQUAKES AND EXPLOSIONS.
Final rept.,
by G. E. Frantti and L. A. Levereault. Apr 64, 39p. Rept. no. 4595 14F; 5178 27T
Contract AF49 638 1079, Proj. 8100; ARPA Order 180 61
Unclassified report

Descriptors: (*Seismic waves, Auditory perception), Decision making, Earthquakes, Recording systems, Magnetic tape, Wave transmission, Propagation, Nuclear explosions, Data processing systems, Tests, Seismographs, Detection.

Magnetic tape recordings of short-period seismic signals from approximately 200 earthquakes and explosions were time-compressed by a factor of up to 512 to shift seismic frequencies to the audible range. These seismic data include the inhomogeneities introduced by substantial variations in the locations of sources and receivers (world-wide), propagation path length (32 to 7000 km), and source magnitude (M = 0.5 to M = 6.5). Subjects were trained with a representative set of the seismic sounds. Auditory experiments were conducted to determine the ability of the human auditory system to distinguish between seismic signals from earthquakes and explosions. The results of the experiments suggest that a trained listener can identify approximately two thirds of the seismic sounds presented. (Author)

AD-437 817 Div. 2
OTS price $4.60

Travelers Research Center, Inc., Hartford, Conn.
RELATIONSHIPS BETWEEN TROPICAL PRECIPITATION AND KINEMATIC CLOUD MODELS.
Progress rept. no. 5, 1 Aug 63-31 Jan 64,
by Edwin Kessler, III, Edward A. Newburg and Geirmundur Arnason. 31 Jan 64, 46p.
Contract DA36 039sc89099, Proj. 3A99 27 005
Unclassified report

Descriptors: (*Rainfall, Tropical regions), Clouds, Atmosphere models, Meteorological parameters, Air mass analysis, Convection, Water, Dynamics, Vapor, Distribution.

The model developments of vapor, cloud, and precipitation distributions in weak and strong circulations and in initially saturated and unsaturated atmospheres are illustrated. Approximately 83% of condensed water is precipitated from a weak circulation which starts from initially saturated conditions; this declines to 60% for a strong circulation which starts from unsaturated conditions. The omission of diffusive entrainment from the model may explain why the model precipitation efficiencies are much higher than estimates of Braham. Precipitation production seems to be most sensitive to the product of circulation intensity times duration, and only weakly sensitive to model microphysical parameters. (Author)

AD-437 861 Div. 2
OTS price $2.60

Michigan Univ., Coll. of Engineering, Ann Arbor.
RAINDROP-SIZE STUDIES.
Final rept.,
by A Nelson Dingle. Oct 63, 30p. Rept. no. 05016 2F
Contract AF19 628 281, Projs. 8620; ORA 05016, Task 862002
AFCRL 63 906 Unclassified report

Descriptors: (*Raindrops, Particle size), Measurement, Rainfall, Distribution, Spectrum analyzers, Thunderstorms, Photometers, Collimators, Analysis, Graphics, Data, Intensity, Evaporation, Melting.

Qualitative analysis of raindrop-size distributions in heavy showers indicates that some of their prominent features can be explained by the combined effects of wind-shear sorting of drops and of the splashing of large drops upon surface obstructions. Computational studies which account for the effects of cloud-droplet accretion, raindrop coalescenc, and evaporation

processes indicate that, in steady-state rain, the origin of large drops lies in snow-aggregation processes above the melting layer. Extending this finding to speculate upon observed differences between heavy shower drop-size distributions in June as compared to October, it is suggested that the relative predominance of the ice-crystal or water-drop processe in convective storms may be indicated by features of the ground-level drop-size distributions. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-435 773 Div. 3
OTS price $4.60

Bjorksten Research Labs., Inc., Madison, Wis.
DEVELOPMENT OF ANTI-AGGLOMERATION METHODS FOR DRY POWDERS.
Final rept., 1 Jul 63-28 Feb 64,
by Luther L. Yaeger, Risto P. Lappala and Joel N. Lipscomb. Mar 64, 46p.
Contract DA18 108AMC171A
Unclassified report

Descriptors: (*Chemical warfare agents, Powders), (*Powders, Chemical warfare agents), Sprays, Particle size, Spray nozzles, Tear gas, Blowers, Laboratory equipment, Atomization, Density, Amino acids, Aromatic compounds, Solvents.

A technique was developed for successfully spray-drying saccharin and para-aminobenzoic acid from solvent systems of 70% acetone, 30% carbon tetrachloride. Particle sizes less than 10 microns in diameter were achieved. Incorporation of an anti-static agent, Catanac SN, markedly increased the flowability of the powders. A spray-dryer was designed and constructed with sufficient adaptability and simplicity to permit evaluation of various atomization devices (spinning disk, centrifugal pressure nozzle, impingement and pneumatic nozzles), hot-gas spray mixing procedure, powder collection and separation equipment. (Author)

AD-436 316 Div. 3
OTS price $4.60

Monsanto Research Corp., Everett, Mass.
NEW CONCEPT STUDIES, CW DEFENSE.
Bimonthly progress rept. no. 4, 1 Jan-29 Feb 64,
by J. O. Smith, B. M. Fabuss, D. A. Duncan and C. H. Lu. 16 Apr 64, 46p.
Contract DA18 108AMC238A
Unclassified report

Descriptors: (*Chemical warfare agents, G agents), (*G agents, Adsorption), (*Adsorption, Carbon), Particle size, Porosity, Effectiveness.

The adsorption of GA agent from the vapor phase on activated carbon is essentially a physical process proceeding by capillary condensation of the agent in the pores of the adsorbent and in the interstices between adsorbent particles. A simple method was developed to correlate the breakthrough curves and breakthrough capacities. In sorption of liquids on sorbents the effective contact angle is a function of temperature. It appears that below a critical wetting temperature for each liquid-solid system, the liquid wets the solid completely. Above this temperature, the contact angle increases with temperature. This finding is important in selecting a solid decontaminant since the efficiency of a decontaminant will decrease above the critical wetting temperature of the liquid-solid system. (Author)

AD-436 549 Div. 3
OTS price $1.60

Southern Research Inst., Birmingham, Ala.
DESIGN STUDY TO DEVELOP INSTRUMENTATION FOR FIELD EVALUATION OF CHEMICAL AGENTS.
Bi-monthly progress rept. Feb-Mar 64,
by Alvin N. Bird, Jr. 16 Apr 64, 8p.
Contract DA18 108AMC32A
Unclassified report

Descriptors: (*Particles, Illumination), (*Aerosols, Special purpose cameras), Oximes, Electrolytic cells, Instrumentation, Photoflash lamps, Chemicals, Electrochemistry.

This report describes the work on the aerosol flash camera and the oxime-electrochemical cell. Some of the advantages, as well as the problems, associated with back-lighting are discussed. The work on an electrochemical meter for measuring agent concentration as a function of time is also discussed in this report. (Author)

AD-436 862 Div. 3, 32
OTS price $1.10

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for June 63.
8 July 63, 3p. Rept. no. TR1
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Documentation, Biological warfare), (*Biological warfare, Documentation), Military requirements.

AD-436 863 Div. 3, 32
OTS price $2.60

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for July 63.
9 Aug 63, 25p. Rept. no. TR2
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Programming (Computers), Design), (*Biological warfare, Documentation), (*Documentation, Biological warfare), Input-output devices, Test methods, Identification, Military requirements, Sampling.

AD-436 864 Div. 3, 32
OTS price $1.60

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for Aug 63.
9 Sep 63, 11p. Rept. no. TR3
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Biological warfare, Vocabulary), (*Subject indexing, Theory), (*Information retrieval. Theory), Language, Design.

AD-436 865 Div. 3, 32
OTS price $4.60

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for Sep 63.
9 Oct 63, 49p. Rept. no. TR4
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Biological warfare, Language), (*Dictionaries, Biological warfare), Vocabulary, Subject indexing, Data processing systems, Automation, Chemical warfare, Epidemiology, Genetics, Pharmacology, Physiology, Biophysics, Immunity, Ecology, Immunology, Cytology, Anatomy, Embryology, Test facilities, Test equipment, Test methods.

AD-436 866 Div. 3, 32
OTS price $1.10

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for Oct 63.
8 Nov 63, 3p. Rept. no. TR6
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Dictionaries, Biological warfare), (*Subject indexing, Vocabulary), (*Vocabulary, Subject indexing).

AD-436 867 Div. 3, 32
OTS price $1.10

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for Nov 63.
6 Dec 63, 4p. Rept. no. TR7
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Biological warfare, Dictionaries), (*Subject indexing, Vocabulary), (*Vocabulary, Subject indexing), Operation, Automation.

AD-436 868 Div. 3, 32
OTS price $1.10

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for Dec 63.
8 Jan 64, 5p. Rept. no. TR8
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Subject indexing, Biological warfare), (*Biological warfare, Subject indexing), (*Biological warfare, Language), Input-output devices, Operation, Coding, Punched tape, Vocabulary.

AD-436 869 Div. 3, 32
OTS price $2.60

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for Feb 64.
9 Mar 64, 30p. Rept. no. TR10
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Subject indexing, Vocabulary), (*Vocabulary, Subject indexing), (*Dictionary, Biological warfare), Pharmacology, Medicine, Identification, Antibiotics, Anticoagulants, Dosage, Storage, Preparation, Poisoning, Therapy, Metabolism, Biochemistry, Biological warfare, Chemical warfare.

AD-436 870 Div. 3, 32
OTS price $1.10

General Electric Co., Washington, D. C.
FORT DETRICK THESAURUS PROJECT.
Monthly technical rept. for Mar 64.
8 Apr 64, 5p. Rept. no. TR11
Contract DA18 064AMC132A
Unclassified report

Descriptors: (*Subject indexing, Biological warfare), (*Biological warfare, Subject indexing), Analysis, Operation, Dictionaries.

AD-436 880 Div. 3
OTS price $8.60

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
TOXIC HAZARDS ASSOCIATED WITH PYROTECHNIC ITEMS.
1 Nov 63, 95p.
NAVWEPS OP2793 Unclassified report

Supersedes 19 May 59 edition.

Descriptors: (*Pyrotechnics, Hazards), Toxicity, Wounds & injuries, Humans, Body, Skin, Eye, Membranes (Biology), Respiratory system, Gastrointestinal system, Blood, Absorption (Biological), Colored smokes, Parachute flares, Aircraft flares, Distress signals, Smokes, Smoke bombs, Smoke munitions.

This publication presents a compilation of the toxicity characteristics of all pyrotechnic compositions in Fleet use. Also presented are those compositions under development by the Department of Defense for Naval use. The publication provides data concerning the degree of injury imposed when Naval personnel are exposed to toxic chemical ingredients, hazardous residues, and resultant products from burning pyrotechnic compositions. (Author)

AD-437 257 Div. 3
OTS price $7.60

Midwest Research Inst., Kansas City, Mo.
INVESTIGATION OF THE FLASHING OF AEROSOLS.
Final rept., 18 Mar 63-17 Apr 64,
by Alan R. Pittaway. 20 Apr 64, 72p.
Contract DA18 108AMC118A, MRI Proj. 2685C
Unclassified report

Descriptors: (*Aerosols, Flammability), (*Chemical warfare agents, Combustion), (*Combustion, Aerosols), Explosive gases, Explosions, Shock waves, Aerosol generators, Ignition, Inhibition, Instrumentation.

This program is concerned with determining flammability of aerosol systems. A complete review of the agent flashing problem is presented together with an analysis of the problem as a whole. A constant pressure combustion chamber and a shock tube were constructed to study aerosol flammability. Studies were conducted with QL-air aerosols, detonation product gas-air mixtures, and the three component detonation product gas-QL-air system. The data show that the system flammability is dictated by the detonation product gas-air flammability and is not significantly affected by the aerosol phase. Moderate strength shock waves will ignite the system but hot metal and glowing carbon particles will not, under the conditions tested. The QL aerosol-air mixture is easily ignited by flame but not by spark. QL aerosol-air mixtures burn with difficulty due to inhibition of the combustion by the products of combustion. (Author)

AD-437 340 Div. 3, 9
OTS price $17.00

Aerojet-General Corp., Downey, Calif.
KINETICS, MECHANISM, AND RESULTANT DROPLET SIZES OF THE AERODYNAMIC BREAKUP OF LIQUID DROPS,
by H. E. Wolfe and W. H. Andersen. 6 Apr 64, 261p. Rept. 0395 04 18SP
Contract DA18 108 405CML829,
Unclassified report

Descriptors: (*Drops, Physical properties), Liquids, Water, Mercury, Silicones, Aerodynamic characteristics, Theory, Scattering, Atomization, Particle size, Time, Aerosols, Shear stresses, Drag, Mathematical analysis, Photographs, Atomization, Impact shock.

A critical review of the breakup of liquids is given, with emphasis on liquid drops. Evidence is presented that the breakup is a rate process and hence must be considered from a time-dependent approach rather than from purely dimensionless parameters, such as Weber or Bond numbers. A theoretical model of the aerodynamic breakup of liquid drops is developed, postulating that the dual breakup mechanisms (bag and stripping) of liquid drops result from pressure and frictional drag on the drop. The derivation of a quantitative expression is presented, predicting aerodynamic breakup times of liquid drops as a function of the gas-flow properties and the physical properties of the drop. A quantitative expression is also developed that predicts the mass-mean diameter of droplets produced by aerodynamic breakup of the drop as a function of the gas-flow properties and physical properties of the drop. (Author)

AD-437 634 Div. 3, 1
OTS price $2.60

Ammunition Engineering Directorate, Picatinny Arsenal, Dover, N. J.
PROCESS ENGINEERING STUDY OF ILLUMINATING AIRCRAFT SIGNALS FOR OPTIMIZING REQUIREMENT, SAMPLING AND ANALYSIS FOR MOISTURE CONTENT,
by Milton Roth. Apr 64, 21p.
AED TM1389 Unclassified report

Descriptors: (*Pyrotechnics, Colored flares), (*Visual signals, Colored flares), (*Colored flares, Aircraft), Moisture, Military requirements, Specifications, Sampling, Optimization, Humidity, Distillation, Magnesium, Copper, Barium compounds, Strontium compounds, Potassium compounds, Sodium compounds, Nitrates, Perchlorates, Oxalates, Halogenated hydrocarbons, Illumination, Test methods, Test equipment, Aromatic compounds, Chlorine compounds.

This study was initiated as a result of moisture problems arising in connection with procurement of green and yellow signals. The applicable specifications controlling the requirement, testing and sampling were MIL-S-1298, 1399 and 1410, which were revised. A project has been initiated for evaluating and selecting instruments suitable for in-process control of the moisture content of pyrotechnics. (Author)

AD-437 676 Div. 3
OTS price $8.60

Litton Systems, Inc., St. Paul, Minn.
COLLECTIVE PROTECTION FOR COMBAT FIELD STRUCTURES.
Bimonthly progress rept. no. 4, 1 Jan-29 Feb 64, by M. I. Landsberg. 8 Apr 64, 100p. Rept. no. 2553
Contract DA18 108AMC214A, Proj. 52405
Unclassified report

Descriptors: (*Armed forces research, Biological warfare), (*Biological warfare agents, Decontamination), (*Evaporators, Refrigeration systems), (*Materials, Permeability), (*Protective coverings, Biological warfare agents), Bacterial aerosols, Military personnel, Clothing, Filters (Fluid), Ventilation, Decontamination kits, Tents, Sampling, Degradation, Coating, Textiles.

4. CHEMISTRY

AD-435 541 Div. 4
OTS price $2.60

Monsanto Research Corp., Dayton, Ohio.
SURVEY OF RECENT RESEARCH ON FLAME EXTINGUISHMENT.
Rept. for Sep 62-Oct 63,
by G. B. Skinner. Feb 64, 24p.
Contract AF33 657 10304, Proj. 6075, Task 607505
ASD TR61 408, suppl. 2 Unclassified report

Descriptors: (*Combustion, Bibliographies), (*Reaction kinetics, Combustion), Flame propagation, Inhibition, Alkenes, Benzene, Argon, Nitrogen, Iodine compounds, Shock tubes, Ammonia, Formaldehyde, Bromine compounds, Fluorine compounds, Hydrocarbons, Chlorine compounds, Hydrogen compounds, Nitrates, Esters, Chloroform, Carbon tetrachloride,

AD-435 690 Div. 4
OTS price $2.60

Picatinny Arsenal, Dover, N. J.
A THERMOCHEMICAL INVESTIGATION OF THE COMPLEX FORMED BY CYCLOTETRAMETHYLENETETRANITRAMINE(HMX) AND DIMETHYLFORMAMIDE(DMF),
by Charles Lenchitz and Rodolph Velicky. Feb 64, 29p.
Proj. 1A222901A211
PA TM1343 Unclassified report

Descriptors: (*HMX, Dissociation), (*Formamides, Dissociation), (*Complex compounds, Thermochemistry), Explosive materials, Ketones, Recrystallization, Chemical bonds, Heat of solution, Combustion, Heat, Crystals, Solutions, Dipole moments, Calorimeters, Test equipment.

The heat of dissociation of the complex formed by cyclotetramethylenetetranitramine and dimethylformamide, HMX:DMF, was measured in DMF. The difference in crystal energy between alpha HMX and beta HMX as measured in acetone is 0.6 kcal/mole. A mechanism for the solution of HMX in DMF is proposed. The energies measured suggests that the bond forming the complex is due to van der Waals forces. It is also suggested that the dipole - dipole interaction makes a significant contribution to the bond energy. (Author)

AD-435 815 Div. 4, 16
OTS price $3.50

Foote Mineral Co., Berwyn, Pa.
A STUDY OF THE APPLICATION OF LITHIUM CHEMICALS TO AIR REGENERATION TECHNIQUES IN MANNED, SEALED ENVIRONMENTS.
Rept. for June 62-June 63,
by Meyer M. Markowitz and Eugene W. Dezmelyk. Feb 64, 208p.
Contract AF33 657 9124, Proj. 6373, Task 637302
AMRL TDR64 1 Unclassified report

Report on Equipment for Life Support.

Descriptors: (*Closed ecological systems, Lithium compounds), (*Lithium compounds, Closed ecological systems), Air, Purification, Confined environment, Thermochemistry, Oxygen, Carbon dioxide, Absorption, Chlorine, Decomposition, Ignition systems.

A thermochemically self-propagating oxygen-generating composition was formulated of 84.82% (by weight) lithium perchlorate oxidant, 10.94% manganese metal powder fuel, and 4.24% lithium peroxide chlorine suppressant additive after an extensive study of lithium perchlorate-fuel interactions. The average available oxygen content from the combustion of this composition is 49.2% (by weight). Studies were performed on utilizing the concomitant carbon dioxide absorption and oxygen release potentials of lithium peroxide. The results of axial flow absorption column experiments show the need for lithium peroxide of high surface area, high porosity,

and retention of the heat of reaction to promote oxygen evolution. Engineering design and development of prototype equipment to supply the oxygen requirement for one man-day and to absorb the carbon dioxide output for one man-day were successfully completed by fabrication and testing of a lithium perchlorate-based oxygen generator and a lithium peroxide-based carbon dioxide absorption unit. (Author)

AD-435 838 Div. 4
OTS price $5.60

Research Inst., Temple Univ., Philadelphia, Pa.
ADDITION AND SUBSTITUTION PRODUCTS OF OXYGEN FLUORIDES.
Annual progress rept. no. 4, 1 Jan-31 Dec 63, by A. G. Streng and A. V. Grosse. 17 Jan 64, 59p.
Contract Nonr3085 01
Unclassified report

Descriptors: (*Oxygen compounds, Synthesis (Chemistry)), (*Fluorine compounds, Synthesis (Chemistry)), (*Xenon, Chemical compounds), (*Krypton, Chemical compounds), Helium group gases, Barium compounds, Liquefied gases, Electric discharges, Acids, Salts, Decomposition, Hydrolysis, Nuclear magnetic resonance, Argon, Helium, Physical properties, Chemical properties.

A new method for the preparation of oxygen fluorides is described; it consists in passing an electric spark discharge in liquid fluorine and oxygen at low temperatures. The reaction products are immediately quenched by the cold liquid. (Author)

AD-435 851 Div. 4, 14
OTS price $1.60

General Precision, Inc., Little Falls, N. J.
HIGH-TEMPERATURE RESISTANT POLYMERS.
Quarterly progress rept. no. 1, 20 Jan-31 Mar 64, by C. Vogel. 15 Apr 64, 20p.
Contract NObs90194
Unclassified report

Descriptors: (*Heat-resistant plastics, Synthesis (Chemistry)), (*Silicon compounds, Heat-resistant plastics), (*Phthalocyanines, Heat-resistant plastics), Inorganic polymers, Metalorganic compounds, Grignard reagents, Titanium compounds, Spectra (Infrared), Stability, Hydrolysis.

This is the first quarterly report of the program for the preparation of high-temperature stable metallophthalocyanine polymers. Improved methods for the synthesis of a number of silicon phthalocyanines were studied. PcSiCl2 was obtained from SiCl4 and phthalonitrile. This compound reacted with n-butyllithium and phenyl magnesium bromide to give the corresponding. di-n-butyl and diphenyl silicon phthalocyanine. Hydrolysis of PcSiCl2 with concentrated sulfuric acid gave PcSi(OH)2. The study of polymer-forming reactions of this silane diol with organic carbinols was initiated. (Author)

AD-435 889 Div. 4, 16
OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
SYNTHESIS OF NITROGEN-CONTAINING HETEROCYCLIC COMPOUNDS POSSESSING PHYSIOLOGICAL ACTIVITY.
Final rept.,
by W. T. Colwell, J. K. Horner and W. A. Skinner. 29 Feb 64, 38p.
Contract DA18 108cml7077, SRI Proj. BU4014
Unclassified report

Descriptors: (*Indoles, Synthesis (Chemistry)), (*N-heterocyclic compounds, Synthesis (Chemistry)), (*Hallucinogens, Indoles), Physiology, Chlorine compounds, Bromine compounds, Chemical analysis, Psilocin, Amines, Nitrates, Ketones, Sulfides.

A large number of nitrogen-containing heterocyclic compounds show high physiological activity. A program was generated which consists of three phases: (a) synthesis of analogs of naturally occurring physiologically active indoles, (b) synthesis of other heterocyclic nitrogen compounds that are related to those possessing physiological activities of interest, and (c) attempts to improve upon the methods of synthesis of compounds found to possess activities of interest. Initial synthetic work is directed toward synthesis of analogs of psilocin (3-dimethylaminoethyl-4-hydroxyindole). These compounds are being evaluated for physiological activity as hallucinogens. (Author)

AD-435 992 Div. 4
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SYNTHESIS OF CESIUM OZONIDE THROUGH CESIUM SUPEROXIDE,
by I. I. Bol'nov and V. V. Matveyev. 25 Mar 64, 10p.
FTD TT64 194 Unclassified report

Trans. from Otedeleniye Khimicheskikh Nauk, No. 6, pp. 1136-1139, 1963.

Descriptors: (*Cesium compounds, Oxygen compounds), (*Oxygen compounds, Cesium compounds), Synthesis (Chemistry), Ozone, Oxides, Chemical reactions, Stability, Chemical properties, Cryogenics.

Cesium ozonide of high purity was obtained by a new reaction between cesium superoxide and ozonized oxygen. By a method of differential thermoanalysis, the behavior of cesium ozonide upon heating was studied and the limit of its thermostability established. (Author)

AD-435 995 Div. 4, 7
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ELECTROSYNTHESIS OF OZONE FROM OXYGEN AT HIGH PRESSURES,
by I. A. Semiokhin, N. I. Kobozev and Ye. N. Pitskhelauri. 25 Mar 64, 9p.
FTD TT64 195 Unclassified report

Trans. from Vestnik Moskovskogo Universiteta, Seriya II. Khimiya, No. 3, pp. 37-40, 1963.

Descriptors: (*Ozone, Synthesis (Chemistry)), Oxygen, High pressure research, Electric discharges, Instrumentation, Construction, Gas discharges, Electrical equipment, Decomposition, Pressure, Electric currents.

AD-436 086 Div. 4
OTS price $6.60

Rochester U., N. Y.
INTERNATIONAL SYMPOSIUM ON PHOTOCHEMISTRY.
Final rept.,
by David J. Wilson. 28 Aug 63, 68p.
Grant AF AFOSR184 63
AFOSR J1095 Unclassified report

Descriptors: (*Symposia, Photochemistry), (*Photochemistry, Symposia), (*Abstracts,

Photochemistry), Photolysis, Liquids, Gases, Solids, Luminescence, Fluorescence, Polymerization, Molecular isomerism.

An international symposium on photochemistry was held at the University of Rochester March 27-29, 1963. The event was supported by the Air Force Office of Scientific Research, the University of Rochester, the eastman Kodak Company, the Xerox Corporation, and Will Scientific. Seventy-five papers covering practically all aspects of photochemistry were presented. (Author)

AD-436 092 Div. 4, 14
OTS price $2.60

Midwest Research Inst., Kansas City, Mo.
SYNTHESIS OF ELASTOMERS CONTAINING Si-N BONDS IN THE MAIN CHAIN.
Quarterly progress rept. no. 8, 1 Jan-31 Mar 64, by L. W. Breed and R. L. Elliott. 14 Apr 64, 23p.
Contract DA23 0720RD1687, DA Proj. 593 32 002, MRI Proj. 2531C
Unclassified report

Descriptors: (*Heat-resistant plastics, Silicon compounds), (*Silicon compounds, Elastomers), (*Nitrogen compounds, Elastomers), Silanes, Polycyclic compounds, Organic nitrogen compounds, Amines, Polymers, Copolymerization, Stability, Hydrolysis, Catalysts, Pyrolysis, Phenols, Resorcinol, Molecular structure, Synthesis (Chemistry), Nuclear magnetic resonance, Viscosity.

Hydrolytic stabilities of silazane monomers and polymers are correlated with chemical structure, and the requirements for hydrolytically stable structures are defined. New polymers with phenyl or ethyl groups substituted on silicon are described. The ethyl-substituted monomers underwent crosslinking reactions during polymerization and did not give soluble polymers. Thermogravimetric analyses of the phenyl-substituted polymers showed that they are considerably less thermally stable than the methyl-substituted polymers. A series of comparative thermogravimetric analyses in air and nitrogen did not reveal a lack of oxidative stability in the polymers. (Author)

AD-436 100 Div. 4
OTS price $1.60

Missouri School of Mines and Metallurgy Rolla.
THE DISSOLUTION OF DEFORMED MAGNESIUM IN SULFURIC ACID.
by W. J. James, M. E. Straumanis and W. J. Daniels. Mar 64, 16p. Rept. no. TR7
Contract Nonr2296 03
Unclassified report

Descriptors: (*Magnesium, Solvent action), (*Metallic crystals, Magnesium), Anodes (Electrolytic cell), Sulfuric acid, Solutions, Solubility, Deformation, Surface properties, Electric currents, Hydrogen.

A study has been made of the effect of the deformation of pure polycrystalline magnesium undergoing anodic dissolution in sulfuric acid. In 0.05 and 0.10 N H_2SO_4 deviations from linearity in anodic dissolution rate versus current density plots occur at approximately 18 and 40 ma/sq. cm. Examination of the metal surfaces following dissolution reveals a black to gray film (probably containing dispersed metallic particles) forming above and in the region of these current densities. The maximum points in the difference effect, delta, curves for deformed metal anodically dissolving in 0.05 and 0.10 N H_2SO_4 are found at approximately 14 and 38 ma/sq. cm. respectively. These results appear to confirm previous studies attributing the maximum and the subsequent decrease in delta primarily to increased anodic disintegration. It would appear that the deformation of the metal does not play a significant role in the mechanism of anodic disintegration. (Author)

AD-436 268 Div. 4, 25
OTS price $1.10

Olin Mathieson Chemical Corp., New Haven, Conn.
PARA-CARBORANE,
by S. Papetti and T. L. Heying. Apr 64, 7p.
Technical rept. no. 23
Contract Nonr3395 00, Task NR356 431
Unclassified report

Descriptors: (*Organoboranes, Spectra (Infrared)), (*Molecular isomerism, Organoboranes), Nuclear magnetic resonance, Chloroform, Deuterated compounds, Borates, Esters, Molecular structure, Synthesis (Chemistry), Decomposition.

AD-436 269 Div. 4
OTS price $1.10

Olin Mathieson Chemical Corp., New Haven, Conn.
PERCHLOROCARBORANE AND PERCHLORONEOCARBORANE,
by Hansjuergen Schroeder, Joseph R. Reiner, Roy P. Alexander and Theodore L. Heying. Apr 64, 6p. TR20
Contract Nonr3395 00, Proj. NR356 431
Unclassified report

Descriptors: (*Organoboranes, Chlorination), (*Chlorine compounds, Organoboranes), Synthesis (Chemistry), Ketones, N-heterocyclic compounds, Amines, Lithium compounds, Spectra (Infrared), Nuclear magnetic resonance, Molecular isomerism, Molecular structure, Metalorganic compounds.

Direct chlorinations of carborane and neocarborane result in undecachlorocarborane ($B_{10}C_{11}OC_2HCl$) and decachloroneocarborane (neo-$B_{10}C_{11}OC_2H_2$), respectively, as the ultimate products. To achieve perchlorination, it became necessary to devise other methods to introduce the additional chlorine atoms. Since $B_{10}C_{11}OC_2HCl$ and neo-$B_{10}C_{11}OC_2H_2$ are carbon acids of acidity comparable to nitroform, and since $KC(NO_2)_3$ reacts readily with chlorine to form $ClC(NO_2)_3$, it was suspected and confirmed that metal and ammonium salts of polychloro-carboranes and -neocarboranes react similarly to give the perchlorinated compounds in almost quantitative yield. In addition it was discovered that direct substitution of $B_{10}C_{11}OC_2HCl$ could be effected with N-chlorosuccinimide. (Author)

AD-436 270 Div. 4
OTS price $2.60

Olin Mathieson Chemical Corp., New Haven, Conn.
A NEW SERIES OF ORGANOBORANES. V. SOME CHEMISTRY OF CYCLIC SILYL CARBORANES,
by S. Papetti, B. B. Schaeffer, H. J. Troscianiec and T. L. Heying. Apr 64, 21p. TR21
Contract Nonr3395 00, Task NR356 431
Unclassified report

Descriptors: (*Organoboranes, Synthesis (Chemistry)), (*Polycyclic compounds, Organoboranes), (*Silicon compounds, Polycyclic compounds), Organic nitrogen compounds, Nitrogen compounds, Oxygen compounds, Pyrolysis, Silicone plastics, Heat-resistant plastics, Chlorine compounds, Spectra (Infrared),

Stability, High-temperature research, Acid, Bases, Molecular structure, Polymers, Inorganic polymers, Boron compounds.

When the carbons of carborane participate in exocyclic rings of O, N and Si atoms the thermal rearrangement of the ortho carborane nucleus to the meta configuration is opposed. These molecules as a whole therefore resist degradation at elevated temperature. Chemically these cyclics are stable under acid conditions but the silicon-carborane carbon bond is attacked by bases. Additional types of cyclic silazanes are reported and reactions of some functional groups at the silicon atoms are described. (Author)

AD-436 271 Div. 4
OTS price $1.60

Olin Mathieson Chemical Corp., New Haven, Conn.
A NEW SERIES OF ORGANOBORANES VI. THE SYNTHESIS AND REACTIONS OF SOME SILYL NEOCARBORANES,
by S. Papetti and T. L. Heying. Apr 64, 11p.
Technical rept. no. 22
Contract Nonr3395 00, Task NR 356 431
Unclassified report

Descriptors: (*Organoboranes, Synthesis (Chemistry)), (*Silicon compounds, Organoboranes), Heat-resistant plastics, Chlorine compounds, Amines, Chemical analysis, Silicon plastics, Molecular structure, Polymers, Inorganic polymers, Boron compounds, High-temperature research.

The preparation and some reactions of silyl neocarboranes are reported. These derivatives contrast the isomeric silyl carboranes since they do not tend to form exocyclic derivatives. Some differences in reactivity of chlorosilyl neocarboranes when compared with the similar carboranes are noted. (Author)

AD-436 419 Div. 4
OTS price $1.10

Faraday Translations, New York.
OPTICAL ANISOTROPY OF STEREOISOMER MOLECULES OF POLYSTYRENE AND POLY-p-METHYLSTYRENE,
by V. N. Tsvetkov and N. N. Boytsova. 1964, 8p.
AERDL T1723 Unclassified report

Trans. from Vysokomolekul. Soedin. (High-Molecular Compounds), 5:3, p. 1263, 1963.

Descriptors: (*Styrene plastics, Stereochemistry), (*Stereochemistry, Styrene plastics), (*Molecular isomerism, Styrene plastics), Molecular rotation, Optical properties, Refractive index, Viscosity, Molecular weight, Polymers, Aromatic compounds, Hydrocarbons.

AD-437 101 Div. 4, 14
OTS price $3.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
BONDING REACTION AND MECHANISM IN CHEMICALLY • BONDED ZIRCONIA.
Interim rept.,
by V. H. Edlin. 23 May 64, 40p. Rept. no. SM45945
Unclassified report

Descriptors: (*Ceramic materials, Chemical bonds), (*Zirconium compounds, Oxides), (*Chemical bonds, Zirconium compounds), Gravimetric analysis, Heat, X-ray diffraction analysis, Phosphoric acids, Phosphates, Fluorine compounds, Fluorides, Acids, Microscopy, Particle size.

This report covers the inital phase of work done to obtain an understanding of the bond mechanism involved in chemically bonded zirconia. Chemical bond phenomena were investigated by means of thermal gravimetric analysis, differential thermal techniques, X-ray diffraction, and stoichiometry studies. Zirconium pyrophosphate (ZrP_2O_7) and hydrated zirconium tetrafluoride (ZrF_4 XH2O) were identified as reaction products for zirconia chemically bonded by monofluorophosphoric acid. Plans for continuing work are also included. (Author)

AD-437 235 Div. 4, 14
OTS price $2.60

Florida Univ., Gainesville.
RESEARCH ON SYNTHESIS OF UNSATURATED FLUOROCARBON COMPOUNDS.
Semi-annual rept. no. 1, 1 Apr-30 Sep 63,
by Paul Tarrant, David Sayers, Jim Heyes, Ward Oliver, and A. C. Wright. 30 Sep 63, 25p.
Contract DA19 129AMC79N
Unclassified report

Descriptors: (*Halogenated hydrocarbons, Synthesis (Chemistry), (*Fluorine compounds, Halogenated hydrocarbons), (*Alkenes, Halogenated hydrocarbons), Metalorganic compounds, Lithium compounds, Bromine compounds, Chlorine compounds, Grignard reagents, Alkynes, Aromatic compounds, Silanes, Pyrolysis, Polymers, Halocarbon plastics, Siloxanes, Benzene, Chemical reactions, Elastomers.

Work is reported on the preparation of unsaturated organic compounds containing F which may give oil and fuel resistant elastomers with low temperature elasticity. Reaction of the Li salts of various acetylenes with fluoroolefins were studied; however, little apart from polymeric material was obtained. Reactions between trifluorovinyl lithium and certain fluoroolefins were investigated. Attempts at preparing Grignard reagents from fluoroolefins were made. A series of silanes containing the trifluorovinyl group were prepared. Attempts to prepare fluoroolefins by free radical techniques for pyrolysis studies were made. Some pyrolytic studies are described. (Author)

AD-437 259 Div. 4
OTS price $1.60

Frick Chemical Lab., Princeton Univ., N. J.
EFFECT OF PLASTICIZATION OF THE VISCOELASTIC PROPERTIES OF POLYVINYL CHLORIDE,
by M. C. Shen and A. V. Tobolsky. Apr 64, 17p.
TR RLT 76
Contract Nonr 1858 07, Proj. NR356 377
Unclassified report

Descriptors: (*Polyvinyl chloride, Viscoelasticity), (*Plasticizers, Phthalates), Esters, Creep, Transition temperature, Relaxation time.

Modulus-temperature and modulus-time curves up to high temperatures were made for polyvinyl chloride and polyvinyl chloride plasticized with 30% dioctyl phthalate. Incorporation of stabilizer and rapid measurements minimized chemical decomposition and diluent evaporation. At temperatures above the melting point of PVC crystallites, flow regions are observed. (Author)

AD-437 285 Div. 4, 10
OTS price $.75

Air Force Aero Propulsion Lab., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AN EXAMINATION OF METHODS FOR CALCULATING VAPOR

PRESSURE OF PETROLEUM HYDROCARBON,
Rept. for Apr-Jul 63,
by Alan E. Zengel and Herbert R. Lander. Mar 64, 27p.
Proj. 3048, Task 304 801
APL TDR64 37 Unclassified report

In cooperation with Monsanto Research Corp., St. Louis, Mo., Contract AF33 657 8193.

Descriptors: (*Hydrocarbons, Vapor pressure), (*Vapor pressure, Mathematical analysis), Phase studies, Boiling, Test methods, Fuels, Petroleum, Distillation, Test equipment, Mixtures.

At high temperatures, the vapor pressure of kerosene-type hydrocarbons is difficult to measure accurately with laboratory apparatus. Because of difficulties in direct measurement of vapor pressure-temperature relationships at high temperatures, the vapor pressure is determined through calculation techniques. This report compares the difficulty and accuracy of five techniques, of which three were basic calculation techniques and two were experimental techniques. To compare the techniques and determine the precision of a calculation technique, four independent workers calculated the vapor pressure-temperature relationship for one high-quality jet fuel and one synthetic blend of seven pure hydrocarbons. Results demonstrate that the method of assuming segments of the true boiling point curve to be pure compounds and finding the total vapor pressure as the sum of the component partial pressures is precise to ±5%. The empirical technique developed by Edmister is less accurate and less precise than the more laborious true boiling point curve technique. (Author)

AD-437 336 Div. 4
OTS price $2.60

Polytechnic Inst. of Brooklyn, N. Y.
THE EFFECTS OF INTERMOLECULAR FORCES ON THE RHEOLOGY OF POLYMERS I: EFFECTS BELOW THE GLASS TEMPERATURE,
by Edward P. Otocka and Frederick R. Eirich.
Mar 64, 25p. Rept. no. PIBAL 687
Contract Nonr839 32FBM, Proj. NR064 457
Unclassified report

Descriptors: (*Polymers, Mechanical properties), (*Copolymerization, Styrenes), Deformation, Tensile properties, Elasticity, Relaxation time, Chemical bonds.

Two series of styrene copolymers were prepared, containing, respectively, acidic and basic comonomers. The mechanical properties of these copolymers were determined for several temperatures below T sub g. Stoichiometric mixtures of these acidic and basic copolymers were studied over the same temperature range, and their mechanical properties compared to those of the parent materials. It was found that the stoichiometric mixtures showed increased modulus, tensile strength and relaxation times. The increases can be related to functional group content and temperature through simple equations. (Author)

AD-437 465 Div. 4, 25
OTS price $1.60

Research Inst., Temple Univ., Philadelphia, Pa.
PRODUCTION, ISOLATION AND IDENTIFICATION OF THE OF., O2F. AND O3F. RADICALS.
Quarterly progress rept. no. 2, 1 Jan-31 Mar 64, by A. D. Kirshenbaum and A. V. Grosse. 31 Mar 64, 18p.
Contract AF04 611 9555, AESC Proj. 3148, AESC Task 3148 0 1
Unclassified report

Descriptors: (*Free radicals, Identification), (*Oxygen compounds, Fluorine compounds), (*Fluorine compounds, Oxygen compounds), (*Radiation chemistry, Fluorine compounds), Superhigh frequency, Boron compounds, Gamma rays, Hydrogen, Atoms, Cryogenics, Excitation, Paramagnetic materials, Oxidizers, Magnetic fields, Halogenated hydrocarbons, Hyperfine structure.

O2BF4 reacts with H atoms at 77 K. to produce O3. O2F2 produces two E.P.R. signals at 77 K. These signals are due to free radicals appearing as intermediate decomposition products and are not due to the original O2F2 or the final decomposition products: free O2 and F2. One of the signals indicates a radical with an unpaired electron, experiencing a hyperfine interaction with only one fluorine necleus. Irradiated samples of O2F2 give a third signal in addition to the two above. O3F2 produces the same two signals as O2F2. The triplet state signal is twice as strong in pure O3F2 as in O2F2 while the hyperfine interaction signal is 50 to 100 times as strong for pure O3F2 as it is for pure O2F2. (Author)

AD-437 567 Div. 4
OTS price $1.10

Illinois U., Urbana.
THE EFFECT OF MOLECULAR STRUCTURE ON THE CLEAVAGE OF OXYGEN-OXYGEN BONDS.
Final rept.,
by J. C. Martin, David Tuleen, Ernest Drew, Thomas Koenig and Thomas Fisher. Feb 63, 6p.
Grant DA ARO D31 124G6, Projs. 59901004 2454C
AROD 2454 7 Unclassified report

Descriptors: (*Reaction kinetics, Decomposition), (*Polycyclic compounds, Chemical bonds), Esters, Lactones, Free radicals, Labeled substances, Tracer studies, Molecular structure, Oxygen, Isotopes.

The importance of bridging to suitable neighboring groups in the transition states of reactions leading to free radicals has been demonstrated by kinetic studies on several systems. Accelerations of O-O bond cleavage by a factor of as much as 10 to the 5th power has been observed in favorable cases when sulfide sulfur is the neighboring group. Oxygen-18 tracer techniques have been used to extend the concept to include the postulation of a bridged intermediate radical in one case. (Author)

AD-437 607 Div. 4
OTS price $5.60

Wisconsin Univ., Madison.
MOLECULAR CATALYSIS AND INTERACTIONS IN AQUEOUS SOLUTIONS.
Final rept., 1 Jan 63-1 Jan 64,
by Takeru Higuchi. 24 Mar 64, 60p.
Contract DA18 108AMC88A
Unclassified report

Descriptors: (*Molecules, Catalysis), (*Catalysis, Molecules), (*Solutions, Catalysts), Water, Kinetic theory, Spectrophotometers, Analysis, Chemical reactions, Energy, Hydrolysis, Phosphonic acids, Esters, Nitrates, Aging (Materials), Aromatic compounds.

AD-437 643 Div. 4, 25
OTS price $1.10

Imperial Coll. of Science and Tech., London (England).
ADSORPTION AND SORPTION COMPLEXES.

Quarterly technical status rept., no. 1, 1 Jul-30 Sep 63,
by J. L. Whiteman. 29 Oct 63, 3p.
Contract DA91 591EUC2980
Unclassified report

Descriptors: (*Sorption, Phosphorus), (*Phosphorus, Sorption), (*Sodium compounds, Sorption), Silicates, Crystals, Mercury, Silver, Vapors, Ions, Crystal structure, Lower-pressure research, Adsorption, Minerals, Great Britain.

AD-437 759 Div. 4, 10, 30
OTS price $10.10

Parametrics Inc., Waltham, Mass.
DETECTION TECHNIQUES FOR HAZARDOUS VAPORS OF ELEMENTAL PROPELLANTS.
Final rept. 1 May-31 Dec 62,
by D. Chleck, O. Cucchiara and T. Donaghue.
Mar 63, 127p.
Contract AF33 657 8916
Unclassified report

Descriptors: (*Rocket propellants, Hazards), (*Vapors, Rocket propellants), (*Fluorine, Chemical analysis), (*Hydrogen, Chemical analysis), (*Oxidizers, Hazards), Test methods, Luminescence, Quenching (Inhibition), Fluorescence, Krypton, Sensitivity, Radioactive isotopes, Copper compounds, Platinum compounds, Molybdenum compounds, Dioxides, Dyes, Gels, Silicon compounds, Test equipment, Oxides.

It is the objective of this report to determine various detection techniques for hazardous vapors of elemental propellants; viz., fluorine and hydrogen. These techniques must be capable of determining the TLV of fluorine and the LEL of hydrogen under field conditions. The other major criteria on which the evaluation was based is that final instrumentation must be simple, have maximum ruggedness, and have the capability of detecting all desired constituents. Three detection systems for fluorine were investigated that meet the requirements of sensitivity, simplicity and ruggedness. These are fluorescent quenching, clathrate and chemiluminescence. Instrumental development is virtually completed on these techniques. (Author)

5. COMMUNICATIONS

AD-435 605 Div. 5
OTS price $8.60

Bendix Field Engineering Corp., Owings Mills, Md.
SPECTRUM SIGNATURE OF RADIO TRANSMITTING SET AN/FRW-2.
14 Feb 64, 93p. Rept. no. S22
Contract AF30 602 2536, Proj. 4557, Tasks 455701, 77314 15
RADC TDR63 71 Unclassified report

Descriptors: (*Radio transmitters, Radiofrequency spectroscopy), Tests, Test equipment (Electronics), Ultrahigh frequency, Frequency modulation, Measurement, Mechanical drawings, Test methods.

This report contains two basic sections. One section consists of the collection of Radio Frequency data of Radio Transmitting Set AN/FRW-2, Serial No. 22. The data from seven different tests are included. The other section contains information and data of a test performed on an antenna designed for use in the operating spectrum of the AN/FRW-2. (Author)

AD-435 772 Div. 5
OTS price $1.60

ITT Communication Systems, Inc., Paramus, N. J.
RESTORAL PRINCIPLES IN A WIDEBAND DISTRIBUTED NETWORK.
12 July 63, 11p. Rept. no. 63 TR 201
Contract AF19 626 5, Task 16
ESD TDR64 258 Unclassified report

Descriptors: (*Communication systems, Networks), (*Military communications, Survival), Bandwidth, Reliability (Electronics), Broadband, Switching circuits, Automatic, Selection.

AD-435 972 Div. 5, 19, 20
OTS price $7.60

U. S. Navy Electronics Lab., San Diego, Calif.
PROJECT FISHBOWL EFFECTS ON OMEGA VLF TRANSMISSIONS. PHASE AND AMPLITUDE EFFECTS DURING EVENTS STARFISH, BLUEGILL TRIPLE PRIME, AND KINGFISH,
by C. J. Casselman, R. L. Denton and J. J. Wilson. 20 Dec 63, 72p.
NEL RR1207 Unclassified report

Descriptors: (*Nuclear explosions, Radio reception), (*Radio communication systems, Nuclear explosions), Propagation, Very low frequency, Phase measurement, Atmospherics, Noise (Radio), Navigational aids, Recording systems, Data, Tables.

The study reported was undertaken to measure the effects on the VLF carrier used by the Omega navigation system during Project FISHBOWL. The three events of the FISHBOWL Project under consideration here were designated STARFISH (9 July 1962), BLUEGILL Triple Prime (26 October) and KINGFISH (1 November 1962). The sections covering the various types of measurement include recordings from all three events and describe the instrumentation and procedures employed. In the descriptions of the tests no extensive analysis of the results is made. However, any faults of system operation, or known irregularities in the recordings, are mentioned or illustrated throughout the various sections, as appropriate. (Author)

AD-435 999 Div. 5
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ELECTRONICS AND RADIO COMMUNICATIONS OF THE FUTURE.
by Yu. Rumer and P. Borodovskiy. 23 Mar 64, 7p.
FTD TT64 79 Unclassified report

Trans. from Sovetskaya Rossiya, no. 164, 2p., 13 July 63,

Descriptors: (*Radio communications systems, Scientific research), USSR, Communication theory, Radio equipment, Ultrahigh frequency, Millimeter waves.

AD-436 029 Div. 5, 8
OTS price $9.10

Dynatronics, Inc., Orlando, Fla.
TELEMETRY PREDETECTION RECEIVER RECORDER/REPRODUCER SYSTEM.
by H. Howe. Dec 63, 110p.
Contract AF08 606 4500
AFMTC TDR63 11 Unclassified report

Descriptors: (*Telemetering receivers, Magnetic recording systems), (*Magnetic recording systems, Telemetering receivers),

Magnetic tape, Design, Electronic equipment, Test methods, Amplifiers, Oscillators, Preamplifiers, Design, Tests, Specifications, Feedback, Frequency stabilizers, Distortion.

This volume contains the final engineering reports covering all phases of the design and development of the Telemetry Predetection Receiver Recorder/Reproducer System. The report is divided into three sections: Section 1 - Telemetry Predetection Receiver Recorder/Reproducer System report by Dynatronics Inc. of Orlando, Florida. Its intent is to describe the technical problems encountered, the solutions to these problems, and the practices employed in design, fabrication, and testing of the Telemetry Predetection System. The development of the Magnetic-Tape Recorder/Reproducer and Predetection Receivers are discussed in individual final reports, which are provided as supplements to the system final report. Section 2 - The over-all project objective with problem breakdown and approach are summarized. The various design approaches to the many complex problems are likewise summarized and illustrated with suitable data to indicate the resulting performance. Principal conclusions reached as a result of the project effort as well as recommendations for future equipment and design are outlined. Section 3 - Development and Manufacture of A 1.5 Megacycle Magnetic Tape Recorder/Reproduce System by Consolidated Electrodynamics Corporation, Pasadena, California, and concludes a program of design, development, and manufacture of a 1.5 megacycle magnetic tape record/reproduce system. (Author)

AD-436 394 Div. 5, 23
OTS price $9.60

Westinghouse Electric Corp., Baltimore, Md.
EDUCATIONAL TELEVISION DISTRIBUTION.
31 July 63, 119p. Rept. no. AA3754
Unclassified report

Descriptors: (*Television communication systems, Education), Distribution, Growth, Channel selectors, Ohio, Area coverage, Airborne, Television stations, United States, Costs, Jet transport planes, Weight, Color television, Narrowband, Specifications, Circuits, Towers, Transmission lines, Television transmitters, Reliability, Training devices.

Ground-broadcasting, airborne-broadcasting, and closed-circuit techniques are analyzed as the means of distribution and they are compared in cost, student coverage, conservation of frequency spectrum, quality, and reliability. Since the airborne system is the least known, airborne television distribution is treated in greater detail and criteria are developed for determining the major parameters of an airborne educational television broadcasting system for nationwide operation. (Author)

AD-436 640 Div. 5
OTS price $17.00

Inst. for Cooperative Research, Univ. of Pennsylvania, Philadelphia.
THE APPLICABILITY OF SIGNAL DENSITY STUDIES IN INTERFERENCE PREDICTION,
by O. M. Salati. 16 Dec 63, 265p. Rept. no. IS63 UR6
Contract AF30 602 1785, Proj. 4540, Task 45191
RADC TDR63 359, suppl. 1 Unclassified report

Descriptors: (*Communication systems, Electromagnetic waves), (*Communication equipment, Interference), Electromagnetic fields, Models (Simulation), Signals, Radio-frequency interference, Noise (radio), Noise (Radar), Sources, Modulation, Polarization.

This paper provides a systematic procedure for studying the problems and interactions of communications systems. The elements of such systems are coupled by a transmission medium which modifies transmitted signals linearly or nonlinearly. Extraneous signals or distrubances are introduced into the system through this medium. The resulting complex of electromagnetic fields in the medium is defined as the electromagnetic environment. The specific problems of this study are: an adequate description of the electromagnetic environment, suitable measures of it and procedures for providing, in the most efficient manner, significant data for particular purposes. (Author)

AD-436 724 Div. 5
OTS price $6.60

Knights (James) Co., Sandwich, Ill.
RESEARCH AND DEVELOPMENT OF PRECISION GLASS -- CRYSTAL UNITS IN THE FREQUENCY RANGE OF 5 TO 10 mc.
Quarterly progress rept. no. 3, 1 Mar-31 Oct 63, by Roger E. Bennett and Jerry Leach. 31 Oct 63, 62p.
Contract DA36 039sc90698, Proj. 3A99 15 004
Unclassified report

Report on Precision Glass Crystal Units.

Descriptors: (*Quartz resonators, Design), (*Radio equipment, Quartz resonators), Frequency, Capacitance, Quartz, Crystals.

The designs and performance characteristics of experimental models of 3rd overtone quartz crystal units, operating at 5, 6, 7, and 9 mc, and having Q's in excess of one million, are described. Data are given on aging, on inharmonic responses, and on the effect of drive level upon frequency. (Author)

AD-436 895 Div. 5, 8
OTS price $8.10

Stelma, Inc., Stamford, Conn.
DEVELOPMENT OF TELETYPEWRITER GROUP AN/GGA-2(XW-2),
by Melvin Van Vlack and Frank Hajdu. 27 Nov 63, 83p.
Contract AF30 635 16451, Proj. 4547, Task 45366
RADC TDR64 98 Unclassified report

Descriptors: (*Teletype systems, Design), (*Secret communication systems, Teletype systems), Printed circuits, Maintainability, Reliability, Cryptography, Errors, Corrections, Transmitter receivers, Configuration, Specifications, Synchronization (Electronics), Computer logic, Circuits, Acceptability, Modules (Electronics), Packaging.

Development is reported of a highly efficient, solid-state error-detection and correction system (AN/GGA-2(XW-2)) for use in long-haul digital-data radio teletypewriter links - (i.e., transistorized version of AN/GGA-2(XW-1) developed by Melpar, Inc. This report describes the: (1) ligic mechanical, and electrical design of the equipment, including the modifications resulting from approved Engineering Change #1: (2) checks performed during final-system tests and extended periods of operation, resulting in a 2000-MTBF predictability; and (3) design characteristics that minimize and/or facilitate maintenance. The AN/GGA-2(XW-2) meets or exceeds specification requirements. The possibility of

obviating the repeat operation in single error-correction is suggested, as are several mechanical-design considerations, which represent refinements that might be incorporated into future models, should the latter be required. (Author)

AD-437 121 Div. 5, 12
OTS price $4.60

Aerospace Corp., Los Angeles, Calif.
ON THE LOGICAL ESTABLISHMENT OF GLOBAL SURVEILLANCE AND COMMUNICATION NETS,
by B. H. Billik and H. L. Roth. 3 Mar 64, 46p.
Rept. no. TDR269 4513 10 5
Contract AF04 695 269
SSD TDR64 5 Unclassified report

Descriptors: (*Global communication systems, Networks), (*Satellite networks, Global communications systems), Space surveillance systems, Communication satellites (Active), Communication satellites (Passive), Orbital trajectories, Data transmission systems, Radio stations, Polar orbit trajectories.

This report establishes criteria for the formation of global surveillance and communication nets and synthesizes some practical examples of these nets. Four properties are postulated which supply all of the necessary and sufficient conditions for the formation of nets. Certain lower bounds are obtained for the numbers of satellites and/or ground stations necessary for establishing worldwide surveillance and communication capability. It is shown that nets can be obtained which are competitive with orbital systems providing only surveillance of the globe. Trade-offs between the number of ground stations and the number and altitude of satellites in a net are discussed at length. (Author)

AD-437 150 Div. 5, 8, 7
OTS price $1.60

Stelma, Inc., Stamford, Conn.
DEVELOPMENT OF ELECTRICAL SYNCHRONIZER SN-293 ()/G.
Quarterly progress rept. no. 3, 1 May 63-31 Jan 64,
by B. Yellen. 31 Jan 64, 16p.
Contract DA36 039sc88946, Proj. 3B31 07 001 11
Unclassified report

Descriptors: (*Synchronization (Electronics). Radio transmission). (*Secret communication systems, Sychronization (Electronics)), Crystography, Radio teletype systems, Teletype systems, Telephone communication systems, Data processing systems, Computers, Model tests, Production, Corrections, Printed circuits, Protective treatments, Clamps.

Development of a general-purpose synchronizer providing cryptographically secure sychronous operation between FIELDATA equipments and telegraph terminals AN/FGC-29, AN/TCC-30, and AN/TCC-4. The report describes work performed, during the third quarterly period, toward: (1) incorporating--into the equipment--the mechanical-design recommendations submitted by the Signal Corps in completion of the evaluation tests performed on the preliminary Service Test Model; and (2) preparation for production of the five Service Test Models which are to be submitted during the final quarterly period. No electrical design modification was necessary, the test revealing that equipment performance met or exceeded specification requirements. Manufacture of the Service Test Models is proceeding on schedule; production, testing, and final delivery are to be completed in the final quarterly period. (Author)

AD-437 203 Div. 5
OTS price $3.60

Aerospace Corp., Los Angeles, Calif.
MINIMUM POWER ANALOGUE COMMUNICATION,
by Jean A. Develet, Jr. 15 May 63, 38p. Rept. no. TDR 169 3250 43 TN 2
Contract AF04 695 169
SSD TDR63 111 Unclassified report

Descriptors: (*Frequency modulation, Broadband), (*Communication satellites (Passive), Communication systems), (*Phase-locked communication systems, Satellites (Artificial)), (*Communication satellites (Active), Communication systems), Noise, Configuration, Design, Feedback, Nonlinear systems.

In this discussion of the theory of minimum power wide-band frequency modulation communications, the following are considered: system configuration, sources of noise, frequency modulation theory, frequency-following reception, phase-lock and FM feedback, thresholding, the effects of system nonlinearities, and the use of pre-emphasis. (Author)

AD-437 629 Div. 5
OTS price $8.10

General Electric Co., Syracuse, N. Y.
SOLID STATE MICROELECTRONIC SYSTEMS.
Quarterly progress rept. no. 3, 1 Mar-1 June 63, by G. Danielson, R. Marolf and R. Warr. 1 June 63, 83p.
Contract DA36 039AMC00020
Unclassified report

Descriptors: (*Telephone communication systems, Modification kits), (*Modification kits, Modules (Electronics)), (*Modules (Electronics), Microminiaturization (Electronics)), Telegraph equipment, Transistors, Switching circuits, Computer logic, Telephone transmitters, Telephone receivers, Timing circuits, Electric filters, Reliability (Electronics), Maintainibility.

The possibility of replacing the existing Telegraph Terminal TH-22 (XC-3)/TG by a microelectronic design has been investigated. It is shown, that by a redesign of the Terminal, standard digital integrated circuit can replace most of the conventional circuits presently used. A considerable reduction in volume, weight and power consumption can be achieved. The realization of a bandpass filter similar to that of the F-316/U by means of active RC filters in a digital filter configuration has been studied. Two filters are being constructed to provide 3db of ripple over a 200 cps bandwidth. The attenuation 100 cps beyond the 3db cutoff frequencies will be 40db and 62db, respectively. Studies of throw-away and replacement concepts for microelectronics were initiated. Additional investigations of tolerance selection to optimize circuit and system reliability have resulted in improvement of analysis procedure. (Author)

AD-437 879 Div. 5
OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
DIVISION 6, SPACE COMMUNICATIONS.
Quarterly progress rept., 1 Apr-30 Aug 63.
15 Sep 63, 39p.
Contract AF19 628 500
Unclassified report

Descriptors: (*Space communication systems, Scientific research), Antennas, Communication satellites (Active), Communication satellites (Passive), Radar systems, Programming (Computers), Radio astronomy, Frequency converters,

Digital systems, Space probes, Instrumentation, Propagation, Wave transmission, Noise (Radio), Communication theory, Networks, Modulation, Coding, Mathematical analysis, Communication equipment, Physics.

Contents: R. F. components; Surface techniques and equipment; Space techniques and equipment; Transmission techniques; Applications; Analysis; Radio physics; Radar; and Engineering.

6. DETECTION

AD-435 613 Div. 6
OTS price $9.60

Texas Instruments Inc., Dallas.
PRODUCTION ENGINEERING MEASURE TO INVESTIGATE PROPERTIES OF INDIUM ANTIMONIDE AND TO PROVIDE 801-C6 INFRARED DETECTORS.
Quarterly progress rept. no. 4, 27 Sep-27 Dec 63, by Robert L. Smythe and William L. Kolander.
27 Dec 63, 118p. Rept. no. 04 64 01
Contract DA36 039AMC01463E, Proj. S4089
Unclassified report

Descriptors: (*Infrared detectors, Production), Indium alloys, Antimony compounds, Indium compounds, Antimony alloys, Performance (Engineering), Glass, Sapphires, Bonding, Manufacturing methods, Silicon compounds, Monoxides, Aluminum coatings, Glow discharges, Broadband, Preamplifiers, Environmental tests, Deoxidation (Metallurgy), Gas leaks, Gold, Evaporation, Cleaning.

Problems studied and methods improved during the quarter were those for area delineation, ohmic contact deposition, acquisition of accurate test data, and extension of shelf life. Fabrication procedures have been written in detail and correlated by a flow chart. The Texas Instruments unbalanced pilot line is shown, along with the capacity of each work position. The processes and procedures have been developed to the extent that photoconductive indium antimonide infrared detectors can be manufactured to meet the specification of the contract. (Author)

AD-435 739 Div. 6, 30
OTS price $10.10

Bendix Field Engineering Corp., Owings Mills, Md.
VALIDATION TEST OF MTI RECEIVER P.O.AN/FPS-66 SERIAL NO. 2.
14 Feb 64, 122p.
Contract AF30 602 2536, Proj. 4557, Tasks 455701; 77314 14 2
RADC TDR64 84 Unclassified report

Descriptors: (*Search radar, Radiofrequency spectroscopy), (*Radar tracking, Performance (Engineering)), (*Radiofrequency spectroscopy, Search radar), Radar receivers, Selection, Phase detectors, Noise (Radar), Electrical properties, Power, Feedback, Gain, Attenuation, Tables.

This report is made up of three basic sections which comprise the collection of data for the MTI System which is a part of the AN/FPS-66 Radar Set. Section 1 of this report contains general information, Section 2 contains the operational characteristics of the MTI System and Section 3 contains the description of tests. (Author)

AD-435 746 Div. 6, 5, 8
OTS price $1.60

Naval Missile Center, Point Mugu, Calif.
EFFECTS OF TELEVISION BANDWIDTH ON TARGET IDENTIFICATION,
by Dennis Shanahan. 3 Apr 64, 12p.
NMC TM64 2 Unclassified report

Descriptors: (*Television guidance, Target recognition), (*Target recognition, Performance (Engineering)), (*Video signals, Bandwidth), (*Bandwidth, Sensitivity), Command & control systems, Low-pass filters, Brightness, Targets, Television cameras, Television display systems, Ranges (Distance), Resolution.

A laboratory test program was conducted to evaluate the effects of video signal bandwidth and target contrast ratio on visual target identification. The results of the tests indicate that: (1) reducing the target contrast ratio degrades target identification abilities; (2) reducing the video signal bandwidth degrades target identification abilities; (3) the ability to identify targets is degraded less by video bandwidth reductions for low contrast targets than it is degraded by high contrast targets; (4) the ability to identify targets is degraded less by target contrast ratio reductions when using a narrow video bandwidth rather than using a wide video bandwidth. (Author)

AD-435 849 Div. 6, 30
OTS price $8.10

Cooley Electronics Lab., Univ. of Michigan, Ann Arbor.
THE MICHIGAN AUTOMATIC DIRECTION FINDER,
by D. L. Mills. Feb 64, 84p. TR137 4853 12T
Contract DA36 039sc89227, Proj. 3A99 06 001 01
Unclassified report

Descriptors: (*Direction finding, Automatic), Data processing systems, Display systems, High frequency, Propagation, Filters, (Electromagnetic wave), Goniometers, Narrowband, Analog computers, Differential equations, Synchronization (Electronics), Circuits, Transistors, Digital systems, Gates (Circuits).

This report describes the theoretical basis and practical instrumentation of the Michigan Automatic Direction Finder (MADFI). The MADFI is an integrated data collection, processing, and display system for determination of bearing statistics of signals in the high-frequency radio spectrum and is intended as a research tool in the study of propagation phenomena and direction finding techniques. Signal processing includes narrowband postdetection filtering and a type of linearly-weighted time averaging which improves the bearing estimates in the presence of multipath and noise processes. The MADFI is equipped with several types of readout suitable for telemetry transmission and computer processing of bearing statistics. (Author)

AD-436 108 Div. 6
OTS price $2.60

University of Southern Calif., Engineering Center, Los Angeles.
MAXIMUM LIKELIHOOD ESTIMATION OF PARAMETER CHANGES IN NOISY SIGNALS,
by Robert M. Gagliardi. Jan 64, 30p. Rept. no. 106
Contract AF04 695 304, Proj. 3182 730F, Task 02
SSD TDR64 68 Unclassified report

Descriptors: (*Signals, Electrical properties), (*Radar signals, Noise (Radar)), (*Radio signals, Noise (Radio)), Communication theory, Detection, Time, Statistical functions, Pseudo-random systems, Probability.

In the detection and tracking of space vehicles, quite often important information is directly

associated with changes occurring in the parameters of signals received from the target. The problem then becomes one of constructing an optimal receiver for the extraction of the properties of these likelihood principles for estimating the time of occurence of parameter changes; i.e., the time at which a signal of one parameter changes to a signal of another parameter, when imbedded in noise. The primary assumption is that the signals and/or the parameters are known a priori. (Author)

AD-436 580 Div. 6, 24
OTS price $7.60

United Aircraft Corp., East Hartford, Conn.
ULTRASONIC LIGHT AND SCANNING ACTIVE OPTICAL IMAGING SYSTEM.
Quarterly status rept. no. 3, 19 Dec 63-19 Mar 64,
by H. G. Aas, R. K. Erf, I. R. Abel and R. Walker.
17 Apr 64, 73p. Rept. no. C930080 9
Contract NOw63 0657d
Unclassified report

Descriptors: (*Optical images, Display systems), (*Beams (Electromagnetic), Optical scanning), Feasibility studies, Transducers, Optical equipment components, Chlorine compounds, Halogenated hydrocarbons, Ultrasonic properties, Ultrasonic radiation, Light, Deflection, Lasers, Photographic recording systems, High speed cameras, Photoelectric cells, Cathode ray tubes, Telescope, Video amplifiers, Resolution, Sensitivity.

The design, fabrication, assembly and test of two liquid ultrasonic deflection cells for the demonstrational model of an active optical imaging system were completed. The cells, employing tetrachloroethylene as the ultrasonic medium are currently being incorporated into the demonstrational model. Of the various test procedures employed to evaluate cell performance, two which are of particular significance are described in detail. The first is a transducer mapping technique to determine the vibrational characteristics of the transducer itself. The second is the use of high speed streak photography as a means to measure overall beam fidelity as it is effected by: (1) light beam diameter, (2) light beam position relative to the sonic pressure nodal points, (3) light beam angular deflection amplitude, and (4) sonic disturbances, such as cavitation and streaming, within the cell. (Author)

AD-437 181 Div. 6
OTS price $5.60

Radiation, Inc., Melbourne, Fla.
MOLECULARIZED PCM TELEMETRY TRANSMITTING SET,
Interim technical progress rept. no. 3,
15 Dec 62-15 Mar 63,
by William A. Price. Mar 63, 59p.
Contract AF33 657 9033, Proj. 4107
Unclassified report

Descriptors: (*Telemetering transmitters, Molecular electronics), (*Molecular electronics, Telemetering transmitters), (*Pulse modulation, Coding), Design, Circuits, Amplifiers, Semiconductor devices, Analog to digital converters, Temperature, Gain.

The design of the required analog circuits for the selected PCM system is discussed in detail. The overall system block diagram and timing is presented as a basis for the better understanding of the design requirements outlined later. (Author)

AD-437 182 Div. 6
OTS price $10.10

Radiation Inc., Melbourne, Fla.
MOLECULARIZED PCM TELEMETRY TRANSMITTING SET.
Interim technical progress rept. no. 4, 15 Mar-15 June 63,
by William A. Price. June 63, 130p.
Contract AF33 657 9033, Proj. 4107
Unclassified report

Descriptors: (*Telemetering transmitters, Molecular electronics), (*Molecular electronics, Telemetering transmitters), (*Pulse modulation, Coding), Circuits, Amplifiers, Transducers, Transistors, Semiconductor devices, Multiplex, Analog devices, Gain, Temperature.

The design goal performance specifications for each circuit under development are reviewed in some detail. The approach used to convert the proposed design into an integrated circuit is discussed with results to date. (Author)

AD-437 183 Div. 6
OTS price $5.60

Radiation Inc., Melbourne, Fla.
MOLECULARIZED PCM TELEMETRY TRANSMITTING SET.
Interim technical progress rept. no. 5, 15 June-15 Sep 63,
by William A. Price. Sep 63, 56p.
Contract AF33 657 9033, Proj. 4107
Unclassified report

Descriptors: (*Telemetering transmitters, Molecular electronics), (*Molecular electronics, Telemetering transmitters), (*Pulse modulation, Coding), Circuits, Analog systems, Amplifiers, Transducers, Transistors, Semiconductor devices.

The results of efforts to produce integrated devices to meet the design goal specifications are covered in detail. As background information, a brief summary of each circuit approach is given. (Author)

AD-437 184 Div. 6, 8
OTS price $5.60

Radiation, Inc., Melbourne, Fla.
MOLECULARIZED PCM TELEMETRY TRANSMITTING SET.
Interim technical progress rept. no. 6, 15 Sep-15 Dec 63,
by William A. Price. Dec 63, 58p.
Contract AF33 657 9033, Proj. 4107
Unclassified report

Descriptors: (*Telemetry systems, Molecular electronics), Telemetering transmitters, Pulse modulation, Feasibility studies, Analog systems, Switching circuits, Amplifiers, Electric current, Oscillators, Packaging, Modules (Electronic), Reliability, Transistors, Resistors, Circuits, Diodes (Semiconductors), Failure (Mechanics), Mathematical models, Manufacturing methods.

The results of efforts to fabricate integrated devices to meet the design goal specifications are presented. In addition, a detailed presentation of the packaging approach for the Electrical Model is given. First order approximations of a reliability prediction are also made. (Author)

AD-437 630 Div. 6
OTS price $3.60

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
PRE-BANSHEE CALIBRATION DETONATION,

by Clyde B. Dobbie and Charles S. Fitzgerald.
11 Dec 63, 33p. Rept. no. B2687
Contract DA49 146XZ092
DASA 1446 Unclassified report

Descriptors: (*Explosions, Electromagnetic waves), (*Electromagnetic waves, Explosions), Pentolite, Detection, Calibration, Magnetic Fields, Surface burst, Detonations, Shock waves, Measurement, Measuring devices (Electrical & Electronic), Signals, Loop antennas, Magnetic recording systems, Magnetic tape, Mechanical drawings.

Electromagnetic measuring equipment was installed at Aberdeen Proving Grounds, Maryland, and operated during the sea level detonation of a spherical 500 pound Pentolite charge. The purpose of this project was to check the operational readiness of the equipment to be used during the BANSHEE test series, to obtain some indication of its EM detecting capabilities, and additionally to obtain a crude measure of the EM signal generated by such a detonation for use in future calibrations. Each set of equipment used consisted of three mutually orthogonal loop antennae, low level amplifiers and matching networks, a 4-channel tape recorder, and a Fiducial generator Type TD-2A. A signal was detected on only one antenna which was located 1,000 feet from the detonation. (Author)

AD-437 697 Div. 6
OTS price $1.10

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
THE COMPUTATION OF SPREADING LOSS IN LAYERED MEDIA,
by Edward S. Eby and Lloyd T. Einstein. 8 Apr 64, 10p.
Proj. 1 610 01 00, Task S F001 03 06 8230
USL 609 Unclassified report

Descriptors: (*Depth finding, Corrections), (*Sonar pulses, Attenuation), Equations, Sonar, Ocean models, Mathematical analysis, Intensity, Ranges (Distance), Velocity.

The spreading loss equation is reexamined in order to provide intensity ratios for all points along a ray in arbitrary layered media. The intensity ratio is shown to be a quadratic function of horizontal range, so that the interpolation problem is solved by the use of a quadratic equation. (Author)

7. ELECTRICAL EQUIPMENT

AD-435 499 Div. 7
OTS price $3.60

Foreign Technology Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PROBLEMS INVOLVED IN THE TOTAL ELECTRIFICATION OF THE USSR AND TECHNICAL PROGRESS IN POWER ENGINEERING CONSTRUCTION,
by P. S. Neporozhniy. 27 Dec 63, 55p.
FTD TT63 820 Unclassified report

Trans. from Problems Sploshnoy Elektrifikatsii SSSR I Tekhnicheskiy Progress V Energostroitel'stve, pp. 3-45, 1960.

Descriptors: Power plants (Establishments), Electrical networks), (*Electric power production, Electrical networks), Power reactors, Power equipment, Electrical industry, Electrical engineering, Thermoelectricity, Electromechanical converters.

AD-435 627 Div. 7
OTS price $2.60

Rocketdyne, Canoga Park, Calif.
HIGH-ENERGY BATTERY SYSTEM STUDY.
Quarterly progress rept. no. 2, 1 Oct-31 Dec 63,
by J. Farrar, R. Keller and C. J. Mazac.
31 Dec 63, 26p. Rept. no. R5405 2
Contract DA36 039AMC03201E, DA Proj. 1G6 22001A053 02
Unclassified report

Descriptors: (*Primary cells, Materials), (*Batteries and components, Materials), Oxide cathodes, Anodes (Electrolytic cell), Cathodes (Electrolytic cell), Magnesium, Lithium, Aluminum, Silver compounds, Manganese compounds, Oxides, Chlorides, Fluorides, Nickel compounds, Lithium compounds, Bromides, Electrolytes, Amides, Carbonates, Alkenes, Polarization, Voltage, Sulfoxides, Sodium compounds, Perchlorates.

Several prospective electrode materials were examined in half-cell studies with a variety of electrolytes: Electrodeposited Li showed favorable potential and low polarization, but the measured efficiencies did not exceed 60%; Mg showed a high efficiency, but passivation phenomena were observed which will cause delay action; The Al potential is not negative enough for this anode to be coupled with solid cathodes in high-energy batteries; AgO, MnO2, NiF2, and NiCl2 were mixed with carbon and tested as cathodes; A periodic current interruptor was constructed because it is essential to distinguish between activation and electrolyte resistance polarization (IR drop). (Author)

AD-435 786 Div. 7, 25
OTS price $.75

Colorado U., Boulder.
DEVELOPMENT OF FILM TYPE 2000 F HEATERS,
by Frank C. Walz. Mar 64, 30p.
Contract AF33 616 6810, Proj. 1347, Task 134704
ASD TDR62 662 Unclassified report

Descriptors: (*Heaters, Films), (*Flame spraying, Plasma jets), (*Ceramic coatings, Heaters), Vacuum apparatus, Vapor plating, Aluminum compounds, Oxides, High-temperature research, Magnesium compounds, Platinum, Nickel, Bonding, Welding, Ultrasonic radiation, Heat-resistant metals & alloys, Chromium alloys, Iron alloys, Manufacturing methods, Nickel alloys, Adhesives, Dielectric films.

This report describes the research performed in the development of 2300 F evac-plated heaters formed on plasma-flame sprayed dielectric substrates of alumina. Following the development of a method of evaporating alumina in substantial quantities and the development of evac-plating techniques for attaching the therminal leads, it will be possible to fabricate this type of heater entirely by evac-plating techniques. This report also describes the research performed in the development of 2000 F film type heaters processed entirely by plasma-flame spraying techniques. These heaters will withstand ten heating cycles to 2000 F with 10 minutes at 2000 F each cycle and are capable of handling power input densities of 100 kw/sq ft. (Author)

AD-435 810 Div. 7, 26, 30, 8
OTS price $3.60

General Instrument Corp., Garden City, N.Y.
PRODUCTION ENGINEERING MEASURE FOR IMPROVED RELIABILITY OF SOLID TANTALUM CAPACITORS.
Quarterly rept. no. 2, 29 Sep-28 Dec 63,
by Floyd R. Banks Jr., Edward M. Moss and A. D. Giacomo. 28 Dec 63, 36p.
Contract DA36 039AMC03622E
Unclassified report

Descriptors: (*Tantalum capacitors, Production), (*Electrolytic capacitors, Manufacturing methods), Reliability, Design, Pyrolysis, Binders, Ageing (Materials), Coatings, Carbon, Silver, Solvent action, Quality control, Processing, Manganese compounds, Capacitance, Nitrates.

Work was performed in five area of process improvements: (1) anode design; (2) pyrolytic conversion; (3) carbon and silver coating; (4) binder ratios (as part of binder control); and (5) ageing. The primary emphasis of the work was upon a detailed assessment of the process improvement studies which have been conducted, through data analysis and correlation. (Author)

AD-435 857 Div. 7
OTS price $2.60

Battelle Memorial Inst., Columbus, Ohio.
MULTIFUELED THERMAL-ENERGY-CONVERSION SYSTEMS.
Quarterly progress rept. no. 6, 1 Oct-31 Dec 63,
by H. R. Hazard, D. E. J. D. Hummell.
31 Dec 63, 28p.
Contract DA36 039sc90838, Proj. 1G6 22001A053 03
Unclassified report

Descriptors: (*Energy conversion, Thermoelectricity), (*Thermoelectricity, Energy conversion), (*Power supplies, Energy conversion), Heat transfer, Boilers, Fuels, Charcoal, Coal, Atomization, Gasoline, Fuel oil, Wood, Combustion, Atomization, Ultrasonic radiation, Generator.

Study of small steam boilers of minimum size and weight for a solid-fuel-fired 150-watt powered source was continued. Satisfactory combustion and efficiency were obtained with a unit weighing 2.54 kg. Unexpected control problems occurred. Evaluation of an ultrasonic atomizer for a multi-fuel liquid-fueled burner was begun. Atomization of gasoline and of No. 2 heating oil was similar over a range of flow rates. (Author)

AD-435 878 Div. 7, 4
OTS price $2.60

Florida Univ., Gainesville Engineering and Industrial Experimental Station.
FUEL CELLS.

Quarterly progress rept., 1 Apr-30 June 63,
by Robert D. Walker, Jr. 12 Aug 63, 24p.
Rept. no. 8
Contract DA49 186AMC45X
Unclassified report

Descriptors: (*Fuel cells, Electrodes), (*Electrodes, Fuel cells), (*Diffusion, Electrodes), Sorption, Dissociation, Ionization, Gases, Electrolytes, Oxygen, Solubility, Transport properties, Models (Simulations), Metals, Surfaces, Hydrogen, Palladium.

Mass transfer in solid metal electrodes was studied intensively with a view to defining the total transfer process so as to permit a reasonably accurate calculation of the resistances to mass transfer of the several steps. A model for the transfer process is presented and the several steps discussed. It appears that mass transfer from the bulk gas cannot be calculated until more is known about the absorption processes occurring at the gas-metal interface. Methods of measuring gas solubility and diffusivity in fuel cell electrolytes are discussed and the results of preliminary measurements presented. A polarographic method appears satisfactory for measuring the diffusivity of oxygen in KOH solutions, and a chromatographic method appears suitable for determining gas solubility. (Author)

AD-435 989 Div. 7
OTS price $8.60

Gulton Industries, Inc., Metuchen, N. J.
INVESTIGATION OF METHODS LEADING TO THE DETERMINATION OF THE STATE OF CHARGE OF NICKEL-CADMIUM BATTERIES.
Final rept., 1 Jan-30 Dec 63,
by J. Wartell and H. N. Seiger. 30 Dec 63, 97p.
Rept. no. 4
Contract DA36 039AMC00109E, Proj. 1G6 22001A053 02
Unclassified report

Descriptors: (*Alkaline cells, Test equipment), (*Test equipment, Batteries & components), Electric bridges, Circuits, Calibration, Nickel, Cadmium, Measuring devices (Electrical and electronic), Storage, Design.

Equivalent circuit measurements were made on BB418 cells as a function of residual capacity and time at 200 and 400 cps. No useful correlation with residual capacity was found. A correlation was found with the equivalent circuit product CR sub c for low frequency data taken previously. To pursue this further, different types of cells were tested at 10 cps. BB418 cells were manually cycled, automatically cycled, and stored and C and R sub c measured as a function of time and residual capacity at 10 cps. The BB418 cells showed the most consistent results, namely that a correlation was found with residual capacity after cells were recently charged or discharged. Circular, sealed cells did not show any consistent relation between C or R sub c and residual capacity. Cells placed on storage did not show any significant change of C or R sub c with time on storage. (Author)

AD-436 310 Div. 7
OTS price $4.60

Thermo Electron Engineering Corp., Waltham, Mass.
THERMIONIC CONVERTER LIFE AND REPEATABILITY INVESTIGATION.
Quarterly progress rept. no. 1, 2 Jan-31 Mar 64,
by C. Z. Kamien. 31 Mar 64, 41p. Rept. no. 60 64
Contract AF33 615 1348, Task 817305 30
Unclassified report

Descriptors: (*Thermionic converters, Scientific research), Life expectancy, Performance (Engineering), Measurement, Test equipment (Electronics), Design, Cesium, Vacuum apparatus, Mass spectroscopy, Electron guns.

The two major goals of the program are: (1) to develop a clear understanding of the factors which affect the life and performance of thermionic converters through the use of adequate diagnostic tools, and (2) to acquire the technology and techniques necessary to design and fabricate experimental converters having long life and high power output on a repeatable and predictable basis. Towards these goals, life test equipment was designed to enable testing any converter for long-sustained life as well as for cyclic life evaluations. Furthermore, diagnostic facilities are incorporated in the design of the life test stations. In addition to the life test equipment, a cesium vapor, repairable thermionic converter was designed and fabricated. (Author)

AD-436 456 Div. 7, 25
OTS price $19.75

Pratt and Whitney Aircraft, East Hartford, Conn.
INVESTIGATION OF MAGNETOHYDRODYNAMIC POWER GENERATION. VOLUME VI - PRELIMINARY DESIGN OF 1000 AND 250 MEGAWATT MHD GENERATORS.
Final rept. 1 Jul-31 Dec 62.
Feb 63, 310p. Rept. no. 2164
Contract AF30 602 2487, Proj. 5561, Task 556101
RADC TDR62 464, Vol. 6
Unclassified report

Descriptors: (*Generators, Magnetohydrodynamics). (*Magnetohydrodynamics, Electric power production). Direct current, Design, Combustion, Combustion chambers, Energy conversion, Nozzles, Guide vanes, Electromagnets, Thermal insulation, Cooling, Heat transfer, Plasma medium, Energy, Exhaust diffusers, Design, Weight, Thermodynamics, Power, Control systems, Starting, Velocity, Temperature, Pressure, Conductivity, Heat transfer, Oxygen, Liquefied gases, Mechanical drawings, Fuel injectors, Electric currents, Temperature.

Presented are the results of preliminary engineering designs of 1000 and 250 megawatt MHD DC power generators which are compatible with continuous wave radio frequency conversion systems. The investigation consists of a systematic survey, analysis and evaluation of the problems involved, and evaluation of available means and materials, formulation of a design philosophy, design of the generators and an evaluation of the resulting design. Combustion, aerodynamic, thermodynamic, electrical and magnetic, thermal, chemical and mechanical effects acting independently or, more generally, in combination, were studied and evaluated. Suitable methods and techniques were used or conceived to handle the problems. The results of the investigation are presented in the form of preliminary design layouts, diagrams, drawings, graphs and tables. (Author)

AD-436 806 Div. 7, 8
OTS price $2.50

Radio Corp. of America, Lancaster, Pa.
THE DEVELOPMENT OF A THERMIONIC CONVERTER MODULE SUITABL E FOR LIQUID METAL HEATING.
Summary technical rept., Jan 63-Feb 64,
by G. Y. Eastman and J. J. O'Grady. Mar 64, 97p.
Contract AF33 657 8005, Proj. 8173, Task 817305 9
APL TDR64 36 Unclassified report

Descriptors: (*Thermionic converters, Modules (Electronic)), (*Modules (Electronic),

Thermionic converters), Liquid metals, Heating, Thermionic emission, Performance (Engineering), Manufacturing methods, Bonding, Molybdenum, Cesium, Niobium alloys, Sapphires, Compatibility, Vapors, Metal seals, Seals (Stoppers), Ceramic materials, Mandrels, Life expectancy, Brazing, High temperature research, Processing, Test methods.

This report describes the continuation of work accomplished under an applied research program to develop a thermionic converter module suitable for liquid metal heating. The A-1198B converter, designed for operation in a liquid metal loop, was operated for more than 2400 hours during life test. A technique for bonding the converter to the liquid metal tubing was developed. Design and fabrication methods perfected in the development of the A-1198B led to the production of the first multiple-unit thermionic energy module. Designated the A-1274, the module consisted of three series-connected converters in a single vacuum-tight envelope using a common cesium reservoir. Modular techniques were extended with the production of a 10-converter unit, a complex structure containing many ceramic-to-metal and metal-to-metal seals. During the program, a number of detailed evaluations of techniques and materials, including cesium compatibility studies, were also made. (Author)

AD-436 825 Div. 7
OTS price $5.60

Bendix Corp., Scintilla Div., Sidney, N. Y.
THERMAL RELEASING CONNECTORS.
Final rept.
by R. W. Brush. 21 Feb 64, 52p.
Contract DA28 017AMC401A
Unclassified report

Descriptors: (*Electric connectors, Release mechanisms), Temperature, Tests, Test methods, Acceptability, Reliability, Statistical analysis, O-rings, Thermoplastics, Mechanical properties, Errors, Radiation effects, Couplings, Vibration, Environmental tests, Design, Tolerances (Mechanics), Shock resistance, Shear stresses, Impact shock, Separation.

The statistical and numerical analysis of the thermal releasing characteristics of the connector has proven the design capable of maintaining a 20 F range of releasing temperatures. Evaluation of the results of the environmental tests has shown an insignificant effect on the thermal releasing characteristics of the connector. Investigation has shown that the basic Pygmy design tolerances and materials are capable of adaptation to a highly reliable connector device. A material investigation has shown that the function of the releasing ring material is dependent on processes peculiar to a given source. (Author)

AD-437 100 Div. 7
OTS price $2.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
REWRAPPING OF WIRE WRAP TERMINALS,
by E. U. Baker. 19 Mar 64, 22p. Rept. no. SM45946
Unclassified report

Descriptors: (*Electric connectors, Electric terminals), (*Electric terminals, Electric connectors), Tables, Measurement, Experimental data, Tests, Environmental tests.

This report documents the results of an investigation of solderless wire wrap connections made on wire wrap terminals which have been subjected to wire removal and rewrapping. The investigation was conducted to determine whether the rewrapped connections were capable of meeting the physical and electrical requirements of DACo Process Requirements Drawing 1P00032. The results of the investigation indicate that wire removal and rewrapping operations do not adversely affect the operational or environmental capabilities of the connections. All test results met the requirements of 1P00032. (Author)

AD-437 112 Div. 7
OTS price $3.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
EVALUATION OF AUTOMATIC WIRE WRAP MACHINE,
by E. U. Baker. 17 Dec 63, 31p. Rept. no. SM44664
Unclassified report

Descriptors: (*Electric connectors, Automatic), (*Electric connectors, Electric terminals), Analysis, Machine tools, Quality control, Production, Specifications, Test equipment, Materials, Tests, Vibration, Shock, Salt spray tests, Environmental tests, Thermal stresses.

This report documents the results of an investigation of solderless wire wrap connections produced by an automatic machine compared to those produced by hand wire wrapping tools. The investigation was conducted to determine whether the connections produced by the automatic machine were of equal or better quality and would meet the requirements of DACo Process Requirements Drawing IP00032. The results of the investigation indicate that there is a significant difference in the quality of automatic machine wrapped connections versus those produced by hand wire wrapping tools. The automatic machine produced more consistent results in both electrical and tensile values than the hand wire wrapping tools. (Author)

AD-437 151 Div. 7, 26, 20
OTS price $9.60

AiResearch Mfg. Co., Phoenix, Ariz.
BEARING TESTS FOR THE SPUR TURBOGENERATOR.
Mar 64, 116p. Rept. no. SY5464R
Contract AF33 657 8954, Proj. 3145, Task 314511
APL TDR64 27 Unclassified report

Report on Dynamic Energy Conversion.

Descriptors: (*Generators, Turbines), (*Journal bearing, Generators), Tests, Nuclear reactors, Endurance, Potassium, Lubricants, Argon, Cooling, Deflection, Metal seals, Oils, Pumps, Hydrodynamics, Test equipment, Films, Spaceborne, Nuclear power plants, Electric power production, Liquid metals.

The results of the liquid-potassium journal-bearing test program for the SPUR turbogenerator are presented. The activities described include the design, assembly and checkout of the bearing test rig, and the results of a successfully completed 250-h endurance test on a hydrodynamic journal bearing using 600 F liquid potassium as the lubricant. Unidirectional loads from 6 to 25 lbs were applied to the bearing operating at a speed of 24,000 rpm. (Author)

AD-437 185 Div. 7, 26
OTS price $1.60

Astron Corp., East Newark, N. J.
PRODUCTION ENGINEERING MEASURE FOR CAPACITOR VAPORIZED TEFLON, METALLIZED GLOW-DISCHARGED

DEPOSITED DIELECTRIC FILM.
Quarterly rept. no. 5, 1 Jan-31 Mar 64,
by Stanley Berinstein. 31 Mar 64, 19p.
Contract DA36 039AMC01459E
Unclassified report

Descriptors: (*Fixed capacitors, Dielectric film), (*Production, Fixed capacitors), Halocarbon plastics, Plastic coatings, Polyethlene plastics, Vapor plating, Aluminum, Electrodes, Manufacturing methods, Materials, Dielectric properties, Electrical properties, Glow discharges.

This report describes the work done during the fifth quarterly contract period directed to the preparation of glow-discharged capacitors. During this period capacitors of all three ratings were wound. It was found that the ''Glo-film'' material is improved to the point where it is possible to wind good capacitor sections with a reasonable yield. Metal-spraying the end connections caused a degradation of the insulation resistance. Work was done on other methods of making end connections and several materials show promise. (Author)

AD-437 530 Div. 7
OTS price $4.60

Eagle-Picher Co., Joplin, Mo.
INVESTIGATIONS LEADING TO THE DESIGN OF A RELIABLE SEALED NICKEL-CADMIUM CELL.
Report no. 5. Quarterly progress rept. no. 1, 1 May-31 Jul 63,
by C. O. Gosch. 31 Jul 63, 38p. Rept. no. 5
Contract DA36 039AMC00135E, Proj. 1G6 22001A053
Unclassified report

Descriptors: (*Batteries and components, Wet cells), (*Wet cells, Design), Anodes, Cadmium, Cathodes, Nickel, Electrolytes, Hydroxides, Cobalt compounds, Potassium compounds, Lithium compounds, Oxides, Zinc compounds, Battery separators, Polyethylene plastics, Storage, Temperature, Voltage, Statistical analysis, Primary cells.

Data accumulated in a study made of the several factors in the design experiment and the response information obtained on charge retention, after a one-month storage period, were analyzed. The design experiment was delineated and the and the response data were detailed for the factors: (A) electrolyte concentration, (B) additives, (C) type of sintered plaque, (D) type of separation, (E) type of negative plate, (F) type of cell. The results of the analysis of the responses of the cells studied in the experiment before and after a one-month storage period were recorded and the influence of the various parameters was shown. (Author)

AD-437 816 Div. 7, 8
OTS price $4.60

General Electric Co., Syracuse, N. Y.
TECHNIQUES AND DEVICES FOR THE PROTECTION OF ELECTRICAL AND ELECTRONIC SYSTEMS FROM LIGHTNING TRANSIENTS,
by Roger E. Buies and Frank A. Fisher. Mar 64, 43p.
Contract AF29 601 5402, Proj. 8809
WL TDR64 26 Unclassified report

Descriptors: (*Lightning arrestors, Launching sites), Lightning, Semiconductor devices, Shielding, Crystal rectifiers, Electronic switches, Ground (Electrical), Transients, Circuits, Diodes (Semiconductor).

This report presents a survey of techniques and devices for the protection of missile systems from the effects of lightning transients. The susceptibility of a missile site to lightning strokes is considered, and the areas within the system where direct strokes and/or induced effects may cause failures in equipment are discussed. The primary concern is with semiconductor devices and associated circuits, but the problems of power distribution are included for a complete analysis. It is recommended that analysis of storm damage reports might yield criteria to serve as a basis for device testing and the development of new applications for devices, with complete protection as an objective. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-435 114 Div. 8, 25
OTS price $11.50

Radio Corp. of America, Somerville, N. J.
PRODUCTION ENGINEERING MEASURE ON 2N1708 SILICON PLANAR EPITAXIAL TRANSISTOR. VOLUME I.
Final rept. 1 May 62-30 Nov 63,
by G. F. Granger, ed. by L. R. Possemato.
30 Nov 63, 160p.
Contract DA36 039sc86729
Unclassified report

Descriptors: (*Transistors, Epitaxial growth), Reliability, Silicon, Electronic switches, Electrical properties, Processing, Manufacturing methods, Crystal substructures, Photoengraving, Semiconductor devices, Diffusion, Metallurgy, Gold alloys, Wire, Gold, Aluminum, Pellets, Environmental tests, Fixed contacts, Metal seals, Nickel, Encapsulated, Storage, Tests, Stresses, Acceleration, Failure (Mechanics), Dissipation, Operation, Life expectancy, Aging (Materials), Switching circuits.

A production run was made to demonstrate the reliability achieved as a result of process improvements incorporated into the processing. A summary of the work performed in each of the major processing areas to effect the improvement is described in this report. A program of life testing, analysis of existing life test data and failure analysis was performed concurrently with the work in the processing area. This program included accelerated testing on both storage and operating life tests which lead to the establishment of acceleration curves, the analysis of results on extended life tests, the analysis of failures, and a study of the effect of aging. (Author)

AD-435 115 Div. 8, 25
OTS price $5.60

Radio Corp. of America, Somerville, N. J.
OPERATING SPECIFICATIONS FOR PRODUCTION ENGINEERING MEASURE ON 2N1708 SILICON PLANAR EPITAXIAL TRANSISTOR. VOLUME II.
Final rept.,
by G. Granger, P. Grenier, W. Keating and ed. by L. R. Possemato. 1963, 58p.
Contract DA36 039sc86729
Unclassified report

Descriptors: (*Transistors, Epitaxial growth), Silicon, Specifications, Operation, Processing, Manufacturing methods, Crystal substructures, Etched crystals, Oxides, Photoengraving, Cleaning, Evaporation, Metal seals, Encapsulation, Reliability, Test equipment, Semiconductor devices, Diffusion, Switching circuits.

AD-435 131 Div. 8
OTS price $8.10

Texas Instruments, Inc., Dallas, Tex.
ADVANCED FABRICATION PROCESSES FOR FUNCTIONAL ELECTRONIC BLOCKS.
Interim engineering rept. no. 1, 2 Dec 63-1 Mar 64,
by W. T. Matzen. 24 Mar 64, 81p. Rept. no. 03 64 18
Contract AF33 615 1242
Unclassified report

Descriptors: (*Integrated circuits, Design), (*Semiconductor devices, Integrated circuits), Silicone, Transistors, Polarization, Dielectric films, Electric potential, Light, Electric filters, Digital systems, Video amplifiers, Heat, Feedback, Temperature, Stability, Manufacturing methods, Processing, Frequency, Amplifiers, Direct current, Low-pass filters.

Physical phenomena and new circuit concepts are being investigated to extend the applicability of integrated circuits. A silicon adaptive element based on the induced channel field effect transistor is being investigated. Adaption is based on polarization of a dielectric film through application of bias and light. A reversible adaption effect was observed on several devices. Based on studies of digital filter characteristics, development of an IF filter is proposed. This filter will be evaluated initially in discrete component form. A video amplifier was fabricated using thermal feedback to eliminate dc components from the output signal. A design is available for the fabrication of a temperature stabilized substrate to be used with a dc amplifier. Critical components of the input stage will be mounted on this substrate to minimize drift. (Author)

AD-435 136 Div. 8
OTS price $2.60

Mictron, Inc., Albany, N.Y.
C.W. X-BAND VOLTAGE TUNABLE OSCILLATOR.
Quarterly progress rept. no. 2, 1 Oct-31 Dec 63,
by M. R. Boyd and M. Weinstein. 31 Dec 63, 23p.
Contract DA36 039AMC03270E, Task 1G6 22001A055 04
Unclassified report

Descriptors: (*Microwave oscillators, X-band), Manufacturing methods, Tests, Design, Radiofrequency oscillators, Performance (Engineering), Magnetrons.

The work during the second quarterly period continued with RF testing and analysis of results of tubes at lower frequencies. The methods and techniques for fabricating the complicated parts required for the designs at higher frequencies were developed. Construction and testing of advanced designs were also begun during this period. (Author)

AD-435 146 Div. 8, 25
OTS price $9.60

HP Associates, Palo Alto, Calif.
ADVANCED FUNCTIONAL ELECTRONIC BLOCK DEVELOPMENT.
Interim engineering rept. no. 3, 1 Mar-31 May 63.
31 May 63, 113p.
Contract AF33 657 9772
Unclassified report

Descriptors: (*Solid state physics, Semiconductors), (*Molecular electronics, Semiconductors). Spectrophotometers, Luminescence, Alloys, Absorption, Cadmium compounds, Antimmy alloys, Mercury alloys, Selenium alloys, Wasers, Photoelectric cells (Semiconductor). Epitaxial growth, Hall effect, Diffusion, Baron compounds, Diodes (Semiconductor), Silicon, Gallium alloys, Arsenic alloys, Diffusion, Zinc, Electroluminescence, Crystal growth, Vacuum apparatus, Impurities.

The exploration of electro-optical effects in S I is described. Difficulties were encountered in determining the optical absorption edge shift with electrical field. The response time of npn planar Si phototransistors was reduced to less

than 1 microsec. In a search for photoconductors responsive to GaAs radiation, attention was given the Cd sub 1-x Hg sub x Se system. The work on GaAs diodes concerned zinc diffused pn junctions using both moderately and degnenerately n-type doped GaAs, as well as sulfur diffused pn junctions using cadmium doped GaAs. A major advance in the understanding of the mechanism of GaAs injection electroluminescence pinpointed the 'loss of efficiency' at room temperature to be only apparent. It was found that a spectral shift increases a hundred-fold the absorption coefficient and thus contributes to enhance self-absorption. Optoelectric amplifiers having a current gain in excess of unity and response time of about 300 ns were constructed. All of the material synthesis and crystal growth is described. (Author)

AD-435 169 Div. 8
OTS price $12.50

Electrical Engineering Research Lab., Univ. of Illinois, Urbana.
APPLICATION OF CROSS-CORRELATION TECHNIQUES TO LINEAR ANTENNA ARRAYS,
by Robert H. MacPhie. Mar 63, 174p. TR67
Contract AF33 657 10474, 760 D-Proj. 6278, Task 6278 01
Unclassified report

Descriptors: (*Antenna configurations, Correlation techniques), Theory, Linear systems, Fourier analysis, Coupled antennas, Radar, Radar jamming.

AD-435 434 Div. 8
OTS price $7.60

TRW Semiconductors, Inc., Lawndale, Calif.
UTILIZATION OF NEW TECHNIQUES AND DEVICES IN INTEGRATED CIRCUITS.
Quarterly rept. no. 3, 1 Nov 63-31 Jan 64. 31 Jan 64, 74p.
Contract AF33 657 11185
Unclassified report

Descriptors: (*Integrated circuits, Transistor amplifiers), (*Transistor amplifiers, Integrated circuits), Processing, Epitaxial growth, Thin films (Storage devices), Gain, Stability, Electric potential, Circuit interconnections, Mechanical drawings, Diffusion, Capacitance, Time, Temperature, Silicon, Noise (Radio), Manufacturing methods, Photoengraving, Chemical milling.

Emphasis was on redicing the practice of necessary structuring techniques required to produce high-performance objectives, read Amplifier and write Amplifier. Final circuit work leading to improved amplifier characteristics was also undertaken. The principal processing techniques acquired were: 1/4-mil geometric spacing factor, buried-layer epitaxial construction, and thin-film deposited resistors. These are sufficient for meeting the electrical requirements of the amplifiers. The final circuit design of the read Amplifier incorporates several features which increases its versatility. The prospect of not being able to achieve a fabrication yield sufficient to build the entire read Amplifier in one chip has led to the final design. (Author)

AD-435 476 Div. 8, 26
OTS price $5.60

Silicon Transistor Corp., Long Island, N. Y.
PRODUCTION ENGINEERING MEASURE TO INCREASE THE RELIABILITY OF THE TRANSISTOR TYPE 2N2034.
Quarterly progress rept. no. 2, 1 Oct-31 Dec 63,
by J. Cocking, J. Courier, F. Des Roches, D. Hughes and E. Martin. 31 Dec 63, 53p.
Contract DA36 039AMC01482E
Unclassified report

Descriptors: (*Transistors, Production), (*Production, Manufacturing methods), (*Manufacturing methods, Transistors). Etched crystals, Soldering, Encapsulation, Hermetic seals, Reliability (Electronics), Nickel, Gold, Temperature, Stability, Storage, Electrical properties, Performance (Engineering).

For tasks 1, 2, 4 and 5, process improvements have been made and new procedures have been established. Initial data obtained confirmed the choices in Tasks 4 and 5. Additional test data is required to substantiate the choices in Task 1 and 2. Task 7 is considered to be more than 50% complete. Because of the problems encountered in scribing in Task 3, a new equipment is being procured. While Task 6 had not been started during this quarter, dry boxes had been used on the PEM pilot line. A detailed discussion of the work on the process improvements is reported, and the work on reliability evaluation is also reported. (Author)

AD-435 491 Div. 8
OTS price $4.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
MICROWAVE RADIATION HAZARD TO AIRCRAFT TRANSITING RADIO AND RADAR BEAMS.
Final rept.,
by John J. Kulik. Dec 63, 43p.
Proj. 110 302R
NAFEC RD64 1 Unclassified report

Descriptors: (*Microwaves, Radiation hazards). (*Radiation hazards, Microwaves). (*Aircraft, Radio waves). (*Radio waves, Aircraft). (*Radar signals, Aircraft). Aviation fuels, Explosive materials, Aviation safety, Power, Density, Analysis, Antennas, Theory, Experimental data.

A hazard to aircraft transiting high power density radio and radar beams exists unless appropriate safety measures are practiced. Susceptibilities of humans, aircraft fuel vapors, avionics and electroexplosive devices to microwave radiation indicate limits of power densities of electromagnetic radiation to which aircraft may be safely exposed. From a study of the literature and analyses conducted herein, it is concluded that aircraft not carrying electroexplosive devices may be safely exposed to average power densities of 10 milliwatts per square centimeter (10 mw/sq cm) or less. Aircraft carrying electroexplosive devices may be safely exposed, under some conditions, to power densities of 1 mw/sq cm. This report contains charts, and procedures for using them, which give distances along the antenna beam axis at which the aforementioned limits are reached. It is recommended that experiments be undertaken to verify analyses in this report and that progress of the military services on electroexplosive devices be monitored to assure the earliest possible implementation less restrictive limits. (Author)

AD-435 511 Div. 8
OTS price $2.60

Electrical Engineering Research Lab., Univ., of Texas, Austin.
STUDY OF VARIOUS RADIO PROPAGATION PROBLEMS AND OF THE PROPAGATION PARAMETERS INVOLVED THEREIN.
Final rept.,

by Alfred H. LaGrone. 31 Jan 64, 27p. Rept. no. 6 59
Contract AF19 604 8038, Proj. 4603, Task 460302
AFCRL 64 54 Unclassified report

Descriptors: (*Radio waves, Propagation), Absorption, Water vapor, Millimeter waves, Power, Correlation techniques, Functions, Measurement, Trees, Dielectrics, Distribution, Earth, Ionospheric propagation, Atmosphere, Refractive index, Antennas.

AD-435 545 Div. 8
OTS price $10.50

Stanford Electronics Lab., Stanford Univ., Calif.
MICROWAVE PROPAGATION OVER MOUNTAIN-DIFFRACTION PATHS.
Final rept.,
by A. Bruce Carlson. Mar 64, 135p. Rept. no. 63 109
Contract AF30 602 2985, Proj. 4505, Task 450501
RADC TDR64 13 Unclassified report

Descriptors: (*Microwaves, Propagation), (*Mountains, Diffraction), Microwave frequency, Theory, Experimental data, Test equipment (Electronics), Terrain, Test methods, Distribution, Troposphere, Scattering, Atmosphere, Refraction, Turbulence, Signals, Measurement.

A theoretical-experimental study of absolute diffraction at microwave frequencies has been conducted. The filed strength in the geometric shadow zone can be predicted from classical (Fresnel-Kirchhoff) diffraction theory when the obstacle approximates the idealized knife edge. However, the modest amount of empirical knowledge available precludes an engineering evaluation of the obstacle-diffraction propagation mechanism from the viewpoint of microwave communications. This study was undertaken in order to describe more fully the characteristics of diffraction propagation, as well as to add to the body of experimental data. While the main concern was the total nature of the propagation, emphasis was given those factors which may affect the successful transmission of information. Conventional measurements of signal level and its variation in time were made. A unique aspect of the experiment was the use of frequency-swept transmission, allowing the direct observation of the propagation frequency response. Polarization and spatial dependence were also examined. The repeater model of diffraction, used implicitly in the literature, was derived and tested explicitly. (Author)

AD-435 549 Div. 8
OTS price $10.10

David Sarnoff Research Center, Princeton, N.J.
THEORY OF ADJUSTABLE SWITCHING NETWORKS.
Final rept.,
by S. Amarel, S. Y. Levy, C. V. Srinivasan and R.O. Winder. 30 Nov 63, 123p. Spec. SR3
Contract AF19 604 8423, Proj. 5632, Task 563202
AFCRL 64 66 Unclassified report

Descriptors: (*Switching circuits, Theory), Linear systems, Computer logic, Sensitivity, Mathematical analysis, Matrix algebra, Networks, Mathematical prediction, Errors, Stability.

The two major parts of this report cover the theory of adjustable switching networks: Threshold Logic and Reliability of Switching Networks. Threshold Logic presents the initial stages of our work on the test-synthesis problem: For given switching functions, to determine whether or not they are threshold functions (test), and if they are, to obtain realizations (synthesis). Included here is a careful discussion of the preliminaries of test-synthesis: checking of unateness and positivization; checking of 2-monotonicity, ordering of arguments, and writing of the canonical form; and derivation of the complement and the reduced representations. Also included is a discussion of the basic system of linear equalities for test synthesis and their reduction. One of two dual solution theorems, upon which our proposed test-synthesis procedure is based, is stated and proved. Finally, more recent work on the test synthesis problem is summarized. We plan to write a comprehensive paper on test-synthesis which includes the material presented here (as its first part) and, in addition, a complete discussion of the results obtained more recently. Reliability of Switching Networks provides partial results on the various problems under investigation. (Author)

AD-435 550 Div. 8
OTS price $8.60

Microwave Lab., Stanford Univ., Calif.
MULTIMEGAWATT BROADBAND MICROWAVE TUBES.
Annual rept. 1 Nov 62-31 Oct 63,
by Marvin Chodoron. Mar 64, 96p. Rept. no. 1116
Contract AF30 602 2575, Proj. 5573, Task 557303
RADC TDR64 58 Unclassified report

Descriptors: (*Traveling wave tubes, Performance (Engineering), Stability, Power, Klystrons, Electron guns, Magnetic fields, Electrical properties, Gain, Bandwidth, S-band, X-band, Oscillation, Electron beams, Plasma physics.

This report covers progress on; (1) oscillation suppression in high power TWT's, (2) study of the centipede TWT structure, (3) improvement of stability of the long-slot TWT, (4) development of a non-periodic dielectric-lined TWT, (5) development of extended-interaction klystrons, (6) study of hollow beam electron guns, (7) study of transverse-wave devices, and (8) investigation of electron beam interaction with a plasma. (Author)

AD-435 564 Div. 8, 26
OTS price $1.60

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE RELIABILITY IMPROVEMENT JET ETCH TRANSISTOR.
Quarterly rept. no. 5, 30 Apr-31 July 63,
by J. N. Edwards, J. H. D. Folster, R. M. Gagne and L. F. Ritterbush. July 63, 16p.
Contract DA36 039sc86721
Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Production, Chemical milling, Etched crystals, Electrodes, Electric potential, Reliability (Electronics), Life expectancy, Coatings, Embedding substances.

Further work on methods of monitoring collector delineation revealed that the V subCE method is the most satisfactory. Consequently, this method will replace the V subCB method formerly in use. The new method is now being evaluated in production. An increase in failure rate occurred during this period. Through exhaustive investigation, the problem was traced to improper

application of the special coating and potting compound. Remedial action was taken, and the problem appears solved, as indicated by latest testing results presented in this report. (Author)

AD-435 565 Div. 8, 26
OTS price $1.60

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE RELIABILITY IMPROVEMENT JET ETCH TRANSISTOR.
Quarterly rept. no. 6, 31 July-31 Oct 63,
by J. N. Edwards, J. H. D. Folster, R. M. Gagne and L. F. Ritterbush. Oct 63, 14p.
Contract DA36 039sc86721
Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Production, Etched crystals, Chemical milling, Electric potential, Electric current, Electrodes, Reliability (Electronics), Embedding substances.

It was found that the V subCE method of monitoring delineation was not completely adaptable to production. A new approach was therefore devised, and this approach, which utilizes the value of I sub cbo and shape of the breakdown curve, is described. The problem which led to a temporary increase in failure rate was solved. Data which confirm this solution and which also show the effect to centrifuging the transistors are presented. (Author)

AD-435 568 Div. 8, 1
OTS price $11.00

National Engineering Science Co., Pasadena, Calif.
ANALYSIS OF ILS GLIDE SLOPE ANTENNAS IN OPERATION AND UNDER DEVELOPMENT.
Final rept.,
by Maurice G. Chernin. Feb 64, 141p. Rept. no. RD64 11
Contract FA WA4391, Proj. 114 31
Unclassified report

Descriptors: (*Dipole antennas, Performance (Engineering)), (*Instrument landings, Glide path systems), (*Glide path systems, Instrument landings), Ultrahigh frequency, Antenna configurations, Coupled antennas, Antenna radiation patterns, Antenna lobes, Stability, Slot antennas, Air traffic, Site selection, Terrain.

ILS glide slope antenna systems are reviewed and evaluated from various standpoints such as the installation site, weather conditions, compatibility with ICAO standards and general effectiveness. Recommendations on several proposed modifications are made together with suggestions for future consideration. All existing FAA glide slope systems are considered as well as several prototype systems under consideration for future installation. It is concluded that the program to up-grade the ILS installations in the United States is proceeding satisfactorily and that the proposed modifications are in accord with the latest and best engineering practices available in today's technology. (Author)

AD-435 614 Div. 8, 26
OTS price $4.60

Geotechnical Corp., Garland, Tex.
DEVELOPMENT OF LOW-POWER, LOW-NOISE PHOTOTUBE AMPLIFIER,
by James E. Keele. 1 Aug 63, 48p. Technical rept. no. 63 73
Contract AF33 600 41824
Unclassified report

Descriptors: (*Phototubes, Amplifiers), (*Amplifiers, Phototubes), Transistors, Printed circuits, Optical equipment, Power supplies, Direct current, Frequency modulation, Bandpass filters, Gain, Performance (Engineering), Reliability (Electronics), Voltage regulators, Inverter circuits, Noise (Radio).

This report describes the development of a low-power phototube amplifier having either analog or frequency modulated carrier output. Test results indicate the amplifier with either type output has the capability of detecting 1.25 x 10 to the minus 18 power w in the pass-band from 0.01 to 5 cps. The amplifier with analog output has a voltage gain of 350K, a total power requirement of 1.56 w, and a dynamic range of 60 db. The amplifier with frequency modulated carrier output has a power requirement of 1.8 w and when combined with an FM discriminator has a gain of approximately 700K and a dynamic range of 70 db. (Author)

AD-435 619 Div. 8
OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
MUTUAL COHERENCE AND THE ARRAY THEOREM,
by Daniel J. Jacavanco. Jan 64, 18p.
Proj. 4642
AFCRL 64 19 Unclassified report

Descriptors: (*Electromagnetic wave reflections, Monochromatic light), (*Antennas, Reflectors), Coherent scattering, Intensity, Fourier analysis, Integral transforms.

The array theorem is investigated by considering mutual coherence. It is first treated under the conditions of monochromatic illumination followed by a development of a generalized array theorem using the mutual coherence function. The coherent limits are imposed upon the radiation with the following results. In the incoherent limit and under the restriction of uniformly illuminated, in-phase antennas it is seen that the array theorem gives the mutual intensity in the field. In the coherent limit the array theorem holds in general but in the partially coherent case, no separable form for mutual coherence function was available. (Author)

AD-435 621 Div. 8
OTS price $9.10

Air Force Cambridge Research Labs., Bedford, Mass.
RESPONSE FUNCTION FOR TAYLOR ANTENNA DISTRIBUTIONS,
by C. J. Drane, Jr. and J. F. McIlvenna, Jr.
Sep 63, 105p.
Proj. 4600
AFCRL 63 368 Unclassified report

Descriptors: (*Antennas, Mathematical analysis), Special functions, Integral equations, Tables, Bessel functions, Errors, Antenna lobes, Integral transforms, Antenna radiation patterns.

AD-435 626 Div. 8
OTS price $1.60

Keystone Conrols Corp., Newark, N.J.
CRYSTAL UNIT CR-(XM-28)/U.
Quarterly progress rept.,
by James M. Ronan, Sep 63, 16p.
Contract DA36 039sc81275
Unclassified report

Descriptors: (*Zuartz resonators, Manufacturing methods), Crystal holders, Glass, Plating, Gold, Electrodes, Aluminum, Control, Frequency, Heat treatment, Production, Industrial equipment, Metal films, Bonding, Glass seals.

Efforts concern establishment of a facility for the manufacture of crystal-units CR-(XM-28)/U utilizing the HC-27/U all glass holder. Comparisons of results achieved using goldplated electrodes with those achieved using aluminum, are made. The same improvement in control of frequency change is noted when the film is annealed prior to sealing in glass. Final details of the limited production equipment were worked out and the equipment is described. A method for determining dimensions of glass units is reported. (Author)

AD-435 643 Div. 8
OTS price $8.10

Radio Corporation of America, Somerville, N. J.
GALLIUM ARSENIDE VARACTOR DIODES.
Final development rept., 27 June 62-27 June 63,
by H. Kressel, A. Solomon, G. Kupsky and H. Lee.
26 Aug 63, 88p.
Contract NObsr87405, Proj. SR008031, Task 9349
Unclassified report

Descriptors: (*Varactor diodes, Gallium alloys), Arsenic alloys, Superhigh frequency, Effectiveness, Resistance (Electrical), Capacitance, Epitaxial growth, Manufacturing methods, Thickness, Electric potential, Frequency, Radiofrequency power, Frequency multipliers, Thermal conductivity, Diffusion, Zinc, Semiconducting films, Heat treatment, Electric currents.

Three types of devices for high efficiency power conversion between 12Gc and 24Gc were designed. The first type, Device A, was designed to yield 40% conversion efficiency, with a minimum of 25mw power input. Device B and C were designed to handle a minimum 100mw and 250mw input power, respectively. High cutoff diodes require an optimum combination of breakdown, series resistance, and junction capacitance. The use of p+nn+ epitaxial structures, with closely controlled n-region properties, offer the best means of achieving this goal. A number of excellent devices were fabricated with such material. Mechanical means of controlling the diode base thickness were also investigated. (Author)

AD-435 742 Div. 8
OTS price $1.60

Raytheon Co., Norwood, Mass.
MEASUREMENT OF PHASE CONSTANT FOR ROCK PROPAGATED SIGNALS,
by Carson K. H. Tsao. Dec 63, 20p. SR 2
Contract AF19 628 2362, Proj. 4600, Task 460008
AFCRL 64 64 Unclassified report

Descriptors: (*Radio waves, Propagation), (*Rock (Geology), Radio waves), (*Phase measurement, Radio waves), Earth, Theory, Electrical impedance, Instrumentation, Loran, Frequency, Polarization, Antenna radiation patterns.

A method is described for determining the phase constant of the rock medium below the surface of the earth. The constant is deduced from the measured phase angle of the mutual impedance between two vertically polarized antennas placed in drill holes extending into the rock. Experiments were conducted on Cape Cod, Massachusetts, determine the phase constant of the rock between two 1000-foot drill holes, separated by a distance of 6000 feet, at frequencies between 100 and 4200 cps. Electrically short monopoles were used in the drill holes, with the overburden above the rock serving as a ground plane. Reference phase was derived from Loran C transmissions at both transmitting and receiving ends of the path. The measured phase constants at these frequencies indicate a large loss tangent for the medium. (Author)

AD-435 743 Div. 8
OTS price $7.60

Army Air Defense Engineering Agency, Fort Meade, Md.
FINAL SURVEY OF INFLATED AND RIGID RADOMES USEABLE WITH PRESENT DEPARTMENT OF ARMY AIR DEFENSE SYSTEMS RADARS,
by Mauno W. Laine. Mar 64, 76p.
Proj. 5130
AADEA TR14 1 Unclassified report

Descriptors: (*Radomes, Army equipment), Electrical properties, Mechanical properties, Construction, Tables, Inflatable structures, Panels (Structural), Sandwich construction, Radar, Glass textiles, Costs, Physical properties, Air defense command.

This report presents the results of a final survey of all useable radomes for Army Air Defense radars, describes the electrical and mechanical characteristics of the various radomes and contains data sheets on their geometry, construction and electrical performance. (Author)

AD-435 766 Div. 8
OTS price $1.60

Electromagnetic Technology Corp., Palo Alto, Calif.
FREQUENCY CONVERTER UNITS FOR L-BAND, S-BAND, C-BAND, AND X-BAND.
Interim development rept. no. 9, 1-31 Mar 64.
15 Apr 64, 17p.
Contract NObsr89536, Proj. SF0100201, Task 9294
Unclassified report

Descriptors: (*Frequency converters, Microwave equipment), L-band, S-band, C-band, X-band, Impedance matching, Networks, Coaxial cables, Modulators, Noise (Radio), Frequency Multipliers, Test equipment (Electronics), Crystal holders, Transformers, Frequency dividers, Mixers (Electronic), Extremely high frequency, Diodes (Semiconductors), Klystrons, Superhigh frequency, Ultrahigh frequency.

Encouraging results were obtained with a coaxial impedance matching network for the L-band version of the 3-db hybrid four-crystal converter using cutoff 1N53B crystals. The K-band match was also improved by the addition of a step transformer. A double balanced modulator based on the TE11 mode in a coaxial line and using four cutoff 1N53B diodes was designed. The noise figure of an experimental single-crystal S-band

up converter was measured as less than 13 db at frequencies at which conversion loss was less than 10 db. The automated apparatus for measuring the rectification characteristics of diodes was brought into operation. Various minor difficulties and operating problems are being overcome. Favorable results were obtained with the distributed-crystal holder approach. The principal advantage of this approach is that it facilitates obtaining a good impedance match at the IF port. (Author)

AD-435 781 Div. 8, 30
OTS price $2.60

ITT Federal Labs., Nutley, N. J.
VLF ENVELOPE TIMING EXPERIMENT.
Quarterly progress rept. no. 2, 8 Sep-7 Dec 63, 7 Dec 63, 23p.
Contract NObsr89358, Task 9210
Unclassified report

Descriptors: (*Time signals, Synchronization (Electronics)), (*Timing devices, Very low frequency), Timing circuits, Pulse communication systems, Pulse transmitters, Pulse generators, Design, Electronic equipment.

Progress is reported on the design of precision VLF envelope timing equipment to be used to demonstrate the feasibility of time synchronization at separate geographical locations. The experiment is in three phases. The first phase is to construct four envelope timing systems and to test this equipment at the contractor's plant. The successful accomplishment of this phase depends upon a demonstration that a given geographical location, an arrival point on the keyed NBA time pulse can be determined with the aid of statistical analysis to a higher precision than was heretofore possible. The goal of this phase is to establish the arrival point with high probability to better the 10 microsecond accuracy. (Author)

AD-435 836 Div. 8
OTS price $7.60

General Dynamics/Fort Worth, Tex.
SLOT FED PARABOLIC ANTENNA.
by J. H. Owens. 25 Feb 64, 72p. Rept. no. FZE272
Unclassified report

Descriptors: (*Parabolic antennas, S-band), Standing wave ratios, Impedance matching, Polarization, Antenna feeds, Antenna radiation patterns, Effectiveness, Measurement, Design, Dipole antennas, Slot antennas, Helical antennas.

A receiving antenna system, useful from 2.0 to 4.0 gc, was designed. It is a slot fed parabolic antenna which provides a gain of 22 db to vertically polarized signals. A good impedance match to 50 ohms is evidenced by a (VSWR) less than 2.0 to 1 over an octave bandwidth. The parabolic section is of unique construction in that it reflects vertically polarized signals with virtually 100% efficency while horizontally polarized signals are passed through umimpeded. A capacitive compensating bar is used in the slot to achieve the required impedance match. (Author)

AD-435 867 Div. 8
OTS price $1.60

Naval Research Lab., Washington, D.C.
THE NRL VARIABLE DELAY GENERATOR,
by W. Beiles, W. K. Gayhart and E. C. Bean.
Feb 64, 14p.
Proj. SF001 10 01 6107
NRL MR1503 Unclassified report

Descriptors: (*Delay circuits, Production), Transistors, Amplifiers, Oscillators, Power supplies, Electronic equipment, Delay lines.

The Advanced Development Section designed and constructed three engineering models to provide a variable delay from 0.5 usec to 3900 usec with no measurable jitter. Such an instrument should be highly useful in the design of electronic circuits, maintenance of test equipment, and evaluation of commercially manufactured equipment. This report describes the equipment development. (Author)

AD-435 871 Div. 8
OTS price $1.60

Army Electronics Research and Development Agency, Fort Monmouth, N. J.
UTILIZATION OF CONFINING MAGNETIC FIELDS IN DUPLEXER APPLICATIONS.
by Maurice Weiner. Feb 64, 12p.
Task 1G6 22001A055 04 42
AELRDL 2432 Unclassified report

Descriptors: (*Radar duplexers, Discharge tubes), Magnetic fields, Electrons, Ions, Plasma sheath, Thickness, Electric potential, Gases, Mathematical analysis.

The feasibility of using a magnetic field to improve the high power performance of gas duplexing tubes is studied. Using available theory, the conditions for the prevention of electron and ion impact with the container walls are determined. One approach compares the sheath thickness and the Larmor radius of the eletron. Another approach studies the possibility of the reversal of the sheath potential in order to retard ion imfield in duplexing tubes has limitations. (Author)

AD-435 968 Div. 8, 30
OTS price $2.60

Hughes Research Labs., Malibu, Calif.
ENHANCED BOMBARDMENT INDUCED CONDUCTIVITY STORAGE TARGET FOR MEMORY TUBES.
Interim engineering rept. no. 1, 4 Dec 63-31 Mar 64,
by N. H. Lehrer. 31 Mar 64, 29p.
Contract AF33 615 1128
Unclassified report

Descriptors: (*Thin films (Storage devices), Semiconductor devices), (*Semiconductor devices, Thin films (Storage devices)), (*Storage tubes, Semiconductor devices), Resolution, Scanning, Electron beams, Sandwich construction, Electric terminals, Dielectrics, Modulation, Secondary emission, Photoconductivity, Direct current, Electric potential, Electrical properties, Measuring devices (Electrical & electronic), Oscilloscopes.

An indication of the stored resolution in the SEBIC film was obtained by an indirect technique, as direct high resolution readout techniques do not yet exist. It was found that with optical input it was possible to store information for many minutes with resolution of thousands of lines per inch. This first measurement of SEBIC resolution confirms previous thinking that the SEBIC layer could store with almost photographic resolution. Electron-beam readout of the SEBIC layer was investigated. To establish a success-

ful technique as a rapidly as possible, the general feasibility of several techniques was experimentally evaluated instead of detailed measurements being taken for each one. To perform these investigations, equipment on hand was improvised for the readout circuitry. After several tests, the storage and readout of information for 30 min and longer was successfully accomplished using a modification of the high energy electron beam technique. With this technique, one defocused electron beam, about 500 V in energy, is used to the potential of one surface of the SEBIC layer. The equilibrium potential over the surface varies with the conductivity of the SEBIC layer, which has been modulated in accordance with the stored information. (Author)

AD-436 001 Div. 8
OTS price $4.60

National Co., Inc., Malden, Mass.
MANUFACTURING METHODS PROCESSES AND DEVELOPMENT FOR CESIUM BEAM FREQUENCY STANDARDS, PHASE II.
Interim engineering progress rept. no. 1, 9 Sep-9 Dec 63.
9 Dec 63, 47p.
Contract AF33 657 10985, RTD Proj. 7 967
ASD IR7 967, vol. 1 Unclassified report

Descriptors: (*Cesium electron tubes, Design), Microwave equipment, Performance (Engineering), Packaging, Frequency multipliers, X-band, Manufacturing methods, Electron beams, Electron multipliers, Electron tube parts, Modulators, Oscillators, Amplifiers, Temperature, Microwave frequency, Transistors, Modules.

The report contains factual data encompassing all work performed during the reporting period on development and procurement of electronic components, the cesium beam tube, and mechanical components. The factual data have been analyzed, and conclusions based on this analysis are presented. (Author)

AD-436 028 Div. 8
OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
UHF DUPLEXERS.
Quarterly progress rept. no. 5, 5 Nov 63-5 Feb 64, by Henry Griffin and Sumner Segal. 5 Feb 64, 30p.
Contract NObsr89105, Proj. SF0010205, Task 6158
Unclassified report

Descriptors: (*Radar duplexers, Ultrahigh frequency), Waveguide circulators, Ferrites, Semiconductor devices, Limiters, Radiofrequency power, Diodes (Semiconductor), Attenuation.

A three port ferrite circulator was developed that successfully demonstrated a power handling capability of 500 KW peak power and 10 KW average power. The insertion loss is less than 0.5 db over the band 400 to 450 mc. For receiver protection after the ferrite circulator, a solid-state diode limiter was developed. The insertion loss of the limiter is less than 0.8 db over the 400 to 450 mc band. A power handling capability of 150 KW peak and 1.5 KW average was demonstrated with a 60 microsec pulse width. A leakage power of 300 mw peak was obtained with no spike leakage. For the 200 to 225 mc band, a complete solid-state diode limiter has been achieved that can successfully switch 200 KW peak power, 2 KW average power, with a 200 microsec pulse width. A transmit loss of 0.1 db and a receive loss of 2.2 db was obtained with a leakage power of 13 mw peak to the receiver. (Author)

AD-436 030 Div. 8, 26
OTS price $1.60

Western Electric Co., Winston-Salem, N. C.
INDUSTRIAL PREPAREDNESS STUDY LACQUER FILM CAPACITORS.
Quarterly progress rept. no. 20, 25 Nov 63-25 Feb 64,
by J. B. Rawls. 25 Feb 64, 18p.
Contract DA36 039SC81268
Unclassified report

Descriptors: (*Capacitors, Manufacturing methods), Production, Carbonates, Varnishes, Processing, Electrical properties, Electric insulation, Resistance (Electrical), Films, Polyester plastics, Aluminum.

Significant improvement was made in both the processing techniques and electrical characteristics of polycarbonate capacitors. Lots are now being produced with high yields on initial lots for dissipation factor, insulation resistance 25 C to 85 C and effective series resistance. A number of changes were made in both the processing techniques and capacitor design which contributed to this improvement. Production of the polycarbonate pilot run samples is nearing completion. Time rate of failure analysis continued in an effort to determine adequate screening procedure for eliminating potential early failures. (Author)

AD-436 034 Div. 8
OTS price $2.60

Illinois Univ., Urbana Engineering Experiment Station.
AN ERROR ANALYSIS OF IONOGRAM TRANSMISSION-CURVE TECHNIQUES,
by Richard Frank Donnelly. Dec 63, 25p.
Rept. nos. TR23; TR1; RRL Pub. no. 224
Contracts Nonr183402; DA039 AMC 03720E, Proj. 371 161
Unclassified report

Descriptors: (*Position finding, Errors), (*Ionospheric propagation, Radio waves), Ranges (Distance), Earth models, Ionospheric disturbances, Pattern recognition, Digital computers, Data processing systems, Radiosondes.

The source of error involved in applying transmission curves to ionograms are analyzed. Several measures for reducing the errors involved in present ionogram transmission - curve systems are presented. Several relationships between range error and the effective-height error, range, and vertical angle of incidence for a spherical earth are presented in a series of graphs useful in radiolocation predictions. A suggestion is made for the solution of the pattern recognition problem involved in applying digital techniques to the pulse information in the ionosonde receiver. (Author)

AD-436 037 Div. 8
OTS price $1.60

Raytheon Co., Newton, Mass.
RESEARCH AND DEVELOPMENT ON TRAVELING IMAGE STORAGE TUBE.
Interim engineering rept. no. 2, 16 Feb-31 Mar 64, by Gordon R. Spencer. Arp 64, 15p.
Contract AF33 616 11674
Unclassified report

Descriptors: (*Image tubes, Feasibility studies), (*Storage tubes, Feasibility studies), Airborne, Spaceborne, Aircraft, Satellites

(Artificial), Aerospace craft, Manufacturing methods, Welds, Electron beams, Glass.

A program of applied research and development is being undertaken by Raytheon Company in response to a general Air Force Requirement for a display device to be used in aircraft and space vehicles, which will provide a continuously-moving, two-dimensional image, generated from information obtained from a line-scan sensor in combination with the forward motion of the vehicle. The feasibility is being investigated of a cathode-ray device employing the following principles and features: tenebrescent (dark-trace) writing and storage, viewing by ambient, reflected light, a continuously-moving, variable speed, endless belt target within the tube, and positive, direct mechanical motion coupling through the vacuum envelope. Progress made thus far confirms the feasibility of the technical approach. (Author)

AD-436 089 Div. 8, 26
OTS price $1.60

Keystone Electronics Co., Newark, N. J.
CRYSTAL UNIT CR-(XM-30).
Quarterly progress rept., July-Sep 63,
by James M. Ronan. Sep 63, 18p.
Contract DA36 39SC85940
Unclassified report

Descriptors: (*Quartz resonators, Manufacturing methods), (*Crystal holders, Manufacturing methods), Production, Industrial equipment, Glass, Glass seals, Very high frequency, O-rings.

AD-436 199 Div. 8
OTS price $4.60

Raytheon Co., Burlington, Mass.
STUDY AND CORRECTION OF SPURIOUS POWER OUTPUT (RK6344 MAGNETRON).
Quarterly engineering rept. no. 2, 22 Oct 63-22 Jan 64,
by P. S. Bottorff and ed. by G. Saeger.
22 Jan 64, 44p. Rept. no. PT687, QR1248
Contract NObsr89518
Unclassified report

Descriptors: (*Magnetrons, Noise (Radar)), Electric fields, Magnetic fields, Radiofrequency power, Microwave frequency, Pulse analyzers, Oscillation, Cavity resonators, Resonance, Harmonic analysis, Waveguide filters.

The QR1248 project concerns the study and elimination of the causes of spurious power output from the RK6344A magnetron. The investigation includes a study of the nature and magnitude of spurious radiations emitted from the RK6344A, with particular emphasis placed on reduction or elimination of spurious signals related to end space, tuner, and output resonances, spurious signals related to magnetic field strength and geometry; and spurious signals harmonically related to the modes of resonance of the interaction structure. The objectives of the program are (1) to develop a tube with characteristics similar to those of the RK6344A, but having reduced spurious power output levels, and (2) to develop techniques for spurious output reduction on other types of magnetrons. (Author)

AD-436 250 Div. 8
OTS price $5.60

Eitel-McCullough, Inc., San Carlos, Calif.
HIGH POWER X-BAND GENERATOR.
Quarterly rept. no. 4, 1 July 63-30 Sep 63,
by William R. ULuebke, Jared Leidigh and Tore Wessel-Berg. 18 Nov 63, 60p.
Contract AF30 602 2756, Proj. 5573, Task 557303
RADC TDR63 524 Unclassified report

Descriptors: (*Microwave amplifiers, X-band), (*Production, Microwave amplifiers), Klystrons, Cavity resonators, Gain, Bandwidth, Effectiveness, Performance (Engineering), Waveguides, Standing wave ratios, Modulators, Radiofrequency power, Electron guns.

The purpose of this program is to develop a klystron amplifier operating at 8 kMc and delivering one megawatt of CW power. In this report a low-average power pulsed tube having an extended-interaction output cavity is described and test results are presented. Additional experimental work on the output circuit is discussed and some design considerations for extended-interaction buncher cavities are included. Further test results of the megawatt level DC beam tester diode are outlined. On the basis of experimental work already performed, the design of high-average power, interim developmental tubes has been carried out and is discussed. Additional theoretical material on the characteristics of extended-interaction structures is given. (Author)

AD-436 277 Div. 8
OTS price $3.60

New York Univ., College of Engineering.
THEORETICAL STUDY OF THE USE OF GEOMETIC TECHNIQUES IN THE MICROWAVE FIELD.
Final rept.,
by D. J. R. Stock and L. J. Kaplan. 15 Jan 64, 33p. TR400 89
Contract AF19 604 7486, Proj. 5635, Task 563501
AFCRL 64 129 Unclassified report

Descriptors: (*Microwave networks, Analysis), (*Algebraic geometry, Theory), Electrical impedance, Scattering, Circuits, Measurement, Matrix algebra, Electrical properties, Iterative methods.

Work on extending geometric-algebraic techniques to the representation of active and passive multi-port networks as well as multi-mode structures is summarized. The equivalent circuits and applicable measurement techniques developed in the course of the work are mentioned. Appendices report on a class of pseudo-lossless networks, geometic properties of certain special two-port and 2n-port transformations, voltage continuity for certain symmetrical 2n-ports, and symmetry considerations for lossless reciprocal 2n-ports. (Author)

AD-436 328 Div. 8, 26
OTS price $4.60

Westinghouse Electric Corp., Philadelphia, Pa.
PRODUCTION ENGINEERING MEASURE TYPE 2N1016B SILICON ALLOY TRANSISTOR.
Quarterly progress repts. 5-6 for period ending 31 Dec 63.
31 Dec 63, 37p.
Contract DA36 039sc86743
Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Silicon, Production, Power, Electrodes, Welding, Processing, Tests, Temperature, Life expectancy, Degasification, Moistureproofing, Silicon alloys, Torque.

Information concerning the completion of five phases of process improvement is discussed.

Mention is made of the substitution of one phase which will be reported as completed in the final report. Additional information concerning the step stress program is presented. (Author)

AD-436 335 Div. 8
OTS price $4.60

Cooley Electronics Lab., Univ. of Michigan, Ann Arbor.
FORCED OSCILLATIONS IN A CLASS OF SELF-BIASED MULTIMODE OSCILLATORS,
by F. N. Bailey. Mar 64, 48p. Rept. nos. TR139, 4853 19T
Contract DA36 039sc89227, Proj. 3A99 06 001 01
Unclassified report

Descriptors: (*Oscillators, Mathematical models), Electric potential, Differential equations, Numerical analysis, Signals.

The behavior of a class of multimode oscillators having two nonlinear elements and operating under the influence of an external signal is analyzed using the approximation procedures of Krylov, Bogoliubov and Mitropolsky. Although the features of the basic circuit are chosen to conform to the general characteristics of common self-biased oscillators, the procedures employed are applicable to a large class of problems involving two nonlinear elements. Through the approximating procedure, the system of nonlinear differential equations describing the basic circuit is replaced by a new, more tractable system of three first-order nonlinear differential equations. Phase space solutions of this approximating system are then used to predict and analyze several interesting features of forced oscillator operation including frequency entrainment, pulling, and superregenerative detection. The results of the theoretical analysis are shown to be in very close agreement with the actual behavior of an experimental oscillator. (Author)

AD-436 336 Div. 8
OTS price $2.60

General Dynamics/Fort Worth, Tex.
RADOME IMPROVEMENT STUDIES,
by H. E. Athey and C. L. Price, Jr. Dec 61, 21p.
Rept. no. ERR FW114
Contract AF33 657 11214
Unclassified report

Descriptors: (*Radomes, Sandwich construction), Metals, Structural parts, Panels (Structural), Ultrahigh frequency, Superhigh frequency, Dielectric properties, Bandwidth, Antenna radiation patterns, Wave transmission, Effectiveness, Thickness, Paints, Glass textiles, Laminated plastics, Electrical conductance, Electrical properties, Reinforcing materials, X band.

Efforts concerned a program directed toward finding simplified and generalized methods of designing radomes containing metal grids. Transmission efficiency measurements of a sandwich panel at various incidence angles were determined over a range of frequencies from 2 to 29.2 kilomegacycles. The sandwich panel had a metallic grid embedded at the center of each skin thickness. Test results indicated that the gridded panel and dielectric filled waveguide possess similar bandpass characteristics. An investigation of antenna beamshift and side lobe effect from the gridded sandwich indicated that negligible beamshift was introduced and side lobes were reduced 1.2 to 2 db. (Author)

AD-436 337 Div. 8
OTS price $4.60

General Dynamics, Fort Worth, Tex.
RESEARCH ON METAL INCLUSIONS IN RADOMES,
by H. E. Athey and C. L. Price, Jr. 21 Dec 60, 42p. Rept. no. ERR FW050
Contract AF33 657 11214
Unclassified report

Descriptors: (*Radomes, Sandwich construction), Panels (Structural), Metals, Wave transmission, Effectiveness, Laminated plastics, Paint, Wire, Ink, Electrical conductance, Copper, Electrical properties, Thickness, Reinforcing materials, Polarization, Wave guides, Bandwidth, Superhigh frequency, Glass textiles, X band, Tests, Silver, Performance (Engineering), Dielectric properties.

Efforts concerned a program directed toward finding a simplified and generalized method of designing radomes with metal inclusions. The theoretical and physical work to obtain transmission efficiency data is described for both solid laminate and sandwich flat panels in which copper wires, conducting ink, and conducting paint were incorporated. Use of metal in radomes offers two main advantages: Metal can be used for reinforcement, and use of metal can change the electrical characteristics of a sandwich type radome so that it can be made thicker physically and still be acceptable electrically. The data shows that radomes can be made polarization sensitive and also that transmission efficiency can be improved. The data also reveal that the addition of metal grids can make radomes display waveguide characteristics rather than standard half-wave and quarter-wave panel characteristics. (Author)

AD-436 351 Div. 8
OTS price $2.60

Westinghouse Electric Corp., Washington, D. C.
HIGH CURRENT AND HIGH VOLTAGE SILICON CONTROLLED RECTIFIERS.
Quarterly rept. no. 5, 1 July-30 Sep 63.
30 Sep 63, 24p.
Contract NObsr87647, Proj. SR0080301, Task 9348
Unclassified report

Descriptors: (*Crystal rectifiers, Electronic switches), Silicon, Encapsulation, Semiconductor devices, Electric potential, Electrical properties, Electric currents, Impurities, Diffusion, Alloys, Surface properties. Measurement.

Results of recent device evaluation indicate that silicon material remains the major problem. Large diameter crystals (1.25 in.) yielded poor results; it is therefore necessary to return to the smaller diameter (1.125 in.) material. The problems of high voltage yield and dv/dt adjustment are examined with respect to design and fabrication process. Results of devices fabricated on 1.250 in. crystal are reviewed. Electrical characteristics as required by the contract are reviewed and analyzed with respect to probable device appliecation. It may be desirable to emphasize some specific characteristics at the expense of others to maximize the usefulness of the device in applications. (Author)

AD-436 390 Div. 8
OTS price $16.50

RCA Defense Electronic Products, New York.
MICROWAVE RADIO RELAY. IONOSPHERIC TRANSMISSION MODELS. TASK 5. CORRELATION BETWEEN TRANSMISSION PARAMETERS OF DISPERSIVE CIRCUITS AND

SYSTEM PERFORMANCE FOR APPLICATION TO ADAPTIVE COMMUNICATIONS SYSTEMS.
Final rept. 28 Mar-30 Sep 63,
by M. Masonson, A. Schmidt and S. Weber. 30 Sep 63, 256p. Rept. no. CR63 419 12
Contract DA36 039SC87240
Unclassified report

Descriptors: (*Ionospheric progagation, Radio communication systems), (*Radio interference, High frequency), Adaptive communication systems, Signal-to-noise ratio, Attenuation, Phase shift, Frequency shift, Errors, Data transmission systems, Doppler shift, Multipath transmission, Modulation, Mathematical models.

The performance of PSK and FSK data systems was determined over dispersive, randomizing transmission circuits. The principal objective is to develop suitable models, or concepts of transmission, via HF ionospheric links, on which to base predictions of performance given the expected channel conditions. (Author)

AD-436 407 Div. 8
OTS price $10.50

Naval Ordnance Lab., Corona, Calif.
FREQUENCY-MODULATED SIGNALS AND THEIR POWER SPECTRA,
by G. H. Nitta. Feb 64, 139p.
NOLC TM74 208 Unclassified report

Descriptors: (*Frequency modulation, Mathematical analysis), (*Signals, Frequency modulation), Electric filters, Linear systems, Low-pass filters, Radiofrequency power, Equations, Series, Fourier analysis, Tuned circuits, Noise (Radio), Statistical functions, Band-pass filters.

Presented herein is a condensation and interpretation of mathematical analyses that relate to frequency-modulated signals, their spectra, and the effect of passing such signals through linear filters. The frequency-modulated signals considered involve almost-periodic and aperiodic signals. Formulas are also given which show the effects of processing frequency-modulated signals through rectangular, RC, and Gaussian-shaped low-pass filters, and Gaussian passband and linear narrowband filters. (Author)

AD-436 421 Div. 8, 25
OTS price $1.10

Faraday Translations, New York.
THE PHOTOELECTRIC EFFECT,
by K. A. Yumatov. 1964, 4p.
AERDL T1720 Unclassified report

Trans. from Zhurnal tekhnicheskoy fiziki (J. Techn. Phys.), 22:1, pp. 177-178.

Descriptors: (*Photoelectric effect, Photocathodes), (*Photoelectrons, Cathodes (Electron tubes)), (*Photocathodes, Theory), Oxygen, Cesium, Impurities, Silver, Fatigue (Mechanics), Photosensitivity, Ultraviolet radiation, Infrared radiation, Gold, Semiconducting films, Antimony.

AD-436 422 Div. 8, 4
OTS price $1.60

Faraday Translations, New York.
OXIDES OF SILVER USED IN THE PRODUCTION OF CESIUM PHOTOCELLS,
by Ye. V. Gernet and K. K. K'yakov. 1964, 11p.
AERDL T1712 Unclassified report

Trans. from Zhurnal tekhnicheskoy fiziki, 4:10, pp. 1867-1876, 1934.

Descriptors: (*Photoelectric materials, Cesium), (*Cesium, Photoelectric materials), Silver compounds, Oxides, Chemical analysis.

AD-436 461 Div. 8
OTS price $3.60

Westinghouse Electric Corp., Pittsburgh, Pa.
MATERIAL PROCESSING AND PHENOMENA INVESTIGATIONS FOR FUNCTIONAL ELECTRONIC BLOCKS.
Interim Engineering rept. no. 5, 6 Sep-6 Dec 63,
by I. M. Mackintosh. 6 Dec 63, 37p.
Contract AF33 657 9897
Unclassified report

Descriptors: (*Semiconductor devices, Manufacturing methods), (*Semiconducting films, Scientific research), (*Molecular electronics, Manufacturing methods), Electrochemistry, Impurities, Boron, Oxides, Silicon, Light, Surface properties, Integrated circuits, Computer logic, Diffusion, Carbides, Phosphorous.

Reproducibility studies on the fabrication of n -on-p layers, which are suitable for the base of p-n-p transistors, are progressing satisfactorily. The first n -on-p diode arrays have been produced and their electrical characteristics have been evaluated. The doping of anodic oxide films with boron was achieved. Judging from the analogy with the phosphorous system, it appears likely that complete control over the whole range of sheet resistances of interest will also be possible for p -on-n layers. The optical resolution of the two systems in use (inverted microscope and stereo-zoom system) has been examined in detail, and was found to be vaery satisfactory for the inverted microscope, but not quite satisfactory for the stereo-zoom system. Geometry controlled anodic oxide growth on n-type silicon under front surface illumination was studied with the stereo-zoom system, and a significant physical difference was found, as compared to back surface illumination. The apparatus for measurements of surface potential of anodized silicon has been further refined. Results that have been obtained to date are reviewed. (Author)

AD-436 536 Div. 8
OTS price $1.60

Sprague Electric Company, North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR COLUMBIUM CAPACITORS.
Quarterly rept. no. 2, 26 Sep-26 Dec 63,
by J. H. D. Folster, E. E. Holley and A. Whitman. 26 Dec 63, 13p.
Contract DA36 039AMC01468E
Unclassified report

Descriptors: (*Fixed capacitors, Niobium), Manufacturing methods, Production, Aging (Materials), Electric potential, Temperature, Capacitors, Electrolytic capacitors, Life expectancy, Tests.

In this quarter, construction of three of the four ratings required for the preproduction sample was begun. Construction on the fourth will begin shortly. Study of aging conditions milder than those normally employed revealed that varying the voltage and temperature aging parameters apparently does not affect the final capacitance, dissipation factor, and leakage current readings on a capacitor. This finding resulted from a

matrix study. To obtain more conclusive results, another matrix is planned during the next quarter in which the best parameters of the first matrix will be incorporated. The first matrix also revealed that following aging bias-read and non-bias-read values of capacitance and dissipation factor are practically equal. The most recent data from the continuing reanodization studies indicate that multiple reanodizations improve the dissipation factors of 330 microfarads -6 V and 33 microfarads -10 V capacitors. (Author)

AD-436 595 Div. 8
OTS price $1.60

Tung-Sol Electric, Inc., Bloomfield, N. J.
HIGH SPEED POWER AMPLIFIER USING ELECTRON BEAM SWITCHED P-N JUNCTIONS.
Interim development rept. 27 Dec 63-26 Mar 64. 14 Apr 64, 15p.
Contract NObsr89493, Proj. SR0080304, Task 9293
Unclassified report

Descriptors: (*Electron multipliers, Electron beams). Pulse amplifiers, Electron tubes, Diodes (Electron tubes). Electron guns, Heat sinks.

Electron beam multiplier (EBM) tubes were further developed to give a 10 ampere positive pulse at 300 volts for a bare junction silicon diode with heat sink. The beam current was in the order of 2 ma. at 20 KV. The current gain was thus 5,000. This was confirmed also by D. C. measurements at low current. The grid pulse was 1 microscecond in duration at 100 pps. These improvements were achieved mainly by modifications in processing to greatly reduce contamination of the diode. Electron gun development has given a 4.0 ma beam current at zero bias and a cut-off of -40 volts. Modifications of electron gun design are in progress to reduce the grid cut-off voltage by a factor of two. The heat sink for the diode was improved with a ceramic lead-in insulator to eliminate gas leakage trouble. (Author)

AD-436 641 Div. 8
OTS price $3.60

Sperry Gyroscope Co., Great Neck, N.Y.
WIDE-BAND BEAM-TYPE PARAMETRIC AMPLIFIER.
Rept. for 1 Sep-31 Dec 63,
by R. Eng, K. Knudsen and A. Roemer. Mar 64, 36p. Rept. no. NA8210 8364 2
Contract AF30 602 3055, Proj. 5573, Task 557301
RADC TDR64 81 Unclassified report

Descriptors: (*Parametric amplifiers, Superhigh frequency), Pumping (Electronics), Gain, Noise (Radio), Tests, Temperature, Helixes, Waveguides, Waveguide windows, Ceramic materials, Waveguide irises, Waveguide couplers, Electron guns, Vacuum seals, Magnetic fields, Electrodes, Electron tubes, Klystrons.

An X-band, beam-type parametric amplifier capable of operating in a 20% instantaneous band of frequency is under development. The device is a degenerate type with the pump frequency fixed at 21 Gc. The amplifier is to have an r-f gain of 25 db and a double-channel noise figure of 2 db. Cold test results for the modified bifilar helix coupler and the quadrupole pump circuit are presented. The general construction of the electron gun, coupler, pump, and collector are discussed a detail with special emphasis on bifilar helix support, vacuum envelope seals, and overall tube and beam alignment. Preliminary generation of a magnetic field having an axial-field variation of 0.5 percent are presented. Also discussed is a specially designed collector minimizing secondary electron interference. (Author)

AD-436 643 Div. 8, 25
OTS price $1.60

Raytheon Co., Burlington, Mass.
PHOTOELECTRIC MILLIMETER WAVE DETECTOR.
Quarterly rept. no. 3,
by G. F. Giggey. Feb 64, 13p.
Contract AF30 602 3015, Proj. 5573, Task 557301
RADC TDR64 56 Unclassified report

Descriptors: (*Millimeter waves, Detectors), (*Photoelectric cells (Semiconductors), Millimeter waves), Photoelectric effect, Magnetic fields, Low temperature research, Cryogenics, Indium alloys, Gallium alloys, Arsenides, Antimomdes, Germanium, Antimony, Superconductivity, Solenoids.

This program is concerned with the application of semiconducting materials to the problem of detection of electromagnetic radiation in the millimeter and submillimeter wavelength range. The method of approach involves the use of the internal photoelectric effect (i.e., photoconductivity) in certain semiconductor materials at very low temperatures. The program can be broken down into four main phases: (a) investigation of indium antimonide in a magnetic field, (b) investigation of gallium arsenide and/or indium arsenide in a magnetic field, (c) investigation of germanium and its behavior under stress, and (d) fabrication of experimental and breadboard model detectors. Photoconductivity and time constant measurements are continuing on various indium antimonide samples in a magnetic field. A breadboard model detector has been made and is in use testing gallium arsenide in magnetic fields up to 30 kilogauss. (Author)

AD-436 696 Div. 8, 15
OTS price $6.60

Case Inst. of Tech., Cleveland, Ohio.
TRANSMISSION ZERO SYNTHESIS USING CONGRUENCE TRANSFORMATIONS,
by John P. Stahl. 28 Jan 64, 66p. TR7
Contract Nonr1141 10, Proj. NR375 370
Unclassified report

Descriptors: (*Transformations (Mathematics), Coupling circuits), (*Coupling circuits, Matrix algebra), Networks, Admittance, Electrical impedance, Voltage, Theorems, Theory.

The use of a congruence transformation is considered in the synthesis of a lossless 2-port coupling network loaded with a resistor. Both the transmission zeros and the open circuit natural frequencies of the network are prescribed. Because of the ease with which it may be synthesized, a resistance-terminated lossless ladder network is determined which has the prescribed open circuit natural frequencies, but which has all transmission zeros at infinity and a congruence transformation which preserves these open circuit natural frequencies. It is then used to shift the transmission zeros from infinity to the locations specified. It is demonstrated that when the lossless part of the original network is transformed by a real nonsingular transformation matrix, the transmission zeros of the transformed network may exist almost anywhere in the s plane but must have quadrantal symmetry. A method is presented which determines this matrix when the location of the new trans-

mission zeros is specified, and it is shown that this matrix always exists. Transformerless networks are considered and a set of conditions on the transformation matrix is formulated which must be satisfied if the transformed network is to exist with transformers. (Author)

AD-436 710 Div. 8
OTS price $3.60

Texas Instruments Inc., Dallas.
DEVELOPMENT OF A TRANSISTOR DELIVERING AN OSCILLATOR OUTPUT OF 250 MILLIWATTS AT 1.5 GIGACYCLES.
Quarterly progress rept. no. 3, 19 Dec 63-19 Mar 64.
17 Apr 64, 32p. Rept. no. 03 64 23
Contract NObsr89423, Proj. SR0080304, Task 9347
Unclassified report

Original contains color plates: All DDC reproductions will be in black and white. Original may be seen in DDC Headquarters.

Descriptors: (*Silicon, Transistors), (*Germanium, Transistors), (*Transistors, Silicon), (*Semiconductor devices, Transistors), Manufacturing methods, Ultrahigh frequency, Resistance (Electrical), Oscillators, Silver alloys, Gold alloys, Antimony alloys, Gold, Military requirements.

Permission was received from BuShips to convert the 0.25 watt 1.5 Gc transistor program from a germanium to a silicon transistor. Conversion was requested because it was felt that the state of development of the silicon transistor was somewhat closer to the contractual requirements than that of the germanium transistor. This report, therefore, has two main sections. The first section covers the final work on the germanium transistor. The second section reports the work on the silicon transistor prior to its inclusion in the program. (Author)

AD-436 711 Div. 8
OTS price $2.60

Texas Instruments Inc., Dallas.
PRODUCTION ENGINEERING MEASURES TO INCREASE TRANSISTOR RELIABILITY.
Quarterly progress rept. no. 5, 1 July-30 Sep 63. 30 Sep 63, 27p. Rept. no. 03 64 09
Contract DA36 039SC86730
Unclassified report

Descriptors: (*Transistors, Quality control), (*Reliability, Transistors), (*Quality control, Transistors), Silicon, Semiconductor devices, Production control, Tests.

The objective of this effort has been to evaluate and adopt proposed process improvements toward achieving a maximum failure rate of 0.01% per 1,000 hours at a 90% confidence level for the Silicon Triple Diffused Transistor Type 2N656. Test results continue to show that the process improvement work of the subject contract has indeed resulted in a highly reliable planar 2N656 transistor. Eleven hundred production planar devices are being placed on stress tests to confium the attainment of the contract objective. (Author)

AD-436 726 Div. 8
OTS price $4.60

General Electric Co., Irmo, S. C.
SOLID ELECTROLYTE TANTALUM FOIL CAPACITOR.
Quarterly research and development rept., 28 Dec 63-27 Mar 64, by A. L. Jenny. 27 Mar 64, 42p.
Contract NObsr89380, Proj. SR0080303, Task 9636
Unclassified report

Descriptors: (*Tantalum capacitors, Foils), (*Foils, Tantalum capacitors), Manufacturing methods, Chemical milling, Heat treatment, Dielectric properties, Electron microscopy, Surfaces, Simulation, Impurities, Voltage Military requirements.

The objective of this program is the development of 150 and 250 volt devices capable of full voltage operation at 85 C, with design objective for the electrical and environmental parameters as listed herein or in Military Specification MIL-C 26655A. (Author)

AD-436 755 Div. 8
OTS price $2.60

Engineering Experiment Station, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS.
Quarterly progress rept., 1 Oct-31 Dec 63, by J. A. Dayton, Jr. and L. Goldstein. 31 Dec 63, 24p.
Task 1G6 22001A055 04
Unclassified report

Descriptors: (*Switching circuits, Degradation), (*Transmit-receive tubes, Attenuation), (Electromagnetic waves, Sound, Plasma physics, Radiofrequency pulses, Propagation, Microwave equipment, Waveguides, Gas discharges, Gases, Magnetrons, Xenon, Oxygen, Electron density.

Experimental investigations into the nature of acoustic waves, produced as a result of intense localized RF breakdown in low pressure gases, are reported. Data concerning the velocity, amplitude, and attenuation of these waves as a function of RF power is presented and discussed. First results indicate that the attenuation is not a function of the electron density in the plasma following the RF discharge. Propagation velocities slower than the speed of sound, which have been reported previously in various gas mixtures, are discussed, and new evidence is introduced to aid in explaining the phenomenon. (Author)

AD-436 758 Div. 8
OTS price $1.60

Edgerton Germeshausen and Grier Inc., Boston, Mass.
DEVELOPMENT OF A SUPER POWER DEUTERIUM THYRATRON.
Quarterly rept. no. 3, 13 Dec 63-13 Mar 64, by Nicholas Reinhardt. 13 Apr 64, 12p. Rept. no. B 2789
Contract NObsr89405, Proj. SR0080301, Task 9434
Unclassified report

Descriptors: (*Electron tubes, Thyratrons), (*Thyratrons, Design), (*Deuterium, Thyratrons), Manufacturing methods, Processing, Cathodes (Electron tubes), Performance (Engineering).

Five prototype super-power deuterium thyratrons were evaluated. The basic design of the tube appears to be quite satisfactory. However, since tubes with satisfactory characteristics throughout life are not being obtained consistently, some modifications are being made in the fabrication techniques and in the processing schedules. (Author)

AD-436 761 Div. 8
OTS price $11.50

Raytheon Co., Bedford, Mass.
INVESTIGATION OF HF/VHF IONOSPHERIC WAVEGUIDANCE

MODES.
Final rept., 1 May 63-15 Mar 64.
15 Mar 64, 154p. Rept. no. BR2893
Contract AF33 657 11432, Proj. 4335, Task 433505
AL TDR64 32 Unclassified report

Descriptors: (*High frequency, Ionospheric propagation), (*Very high frequency, Ionospheric propagation), (*Ionospheric propagation, Very high frequency), Data processing systems, Digital computers, Spectrum analyzers, Analysis, Experimental data, Waveguides, Scattering, Radio signals.

The report presents the results of an experimental activity devoted to a preliminary investigation of the ''whispering gallery'' behavior of the earth's ionosphere below the F2 layer maximum, at HF and VHF. Endo-ionospheric waveguidance propagation has been investigated by using ground-based links in the band 20 to 50 mc/s; wave injection/extraction into/from the mode, otherwise impossible from the earth's surface, has been sought through a concentrated scattering center (meteor, aurora column, sporadic E patch, etc.) naturally occurring above at least one of the link terminals, with distributed ionospheric scattering as extraction/injection mechanism for the other terminal. At 23 mc/s the characteristics of the received signals, especially their duration, often exceeding one hour, did not always allow a clear-cut distinction between conventional multihop propagation and the endo-ionospheric waveguidance mechanism associated with long-lasting aurora and sporadic E scatterers as wave injectors/extractors. At 30 and 40 mc/s burst-type signals have been received at the Arcetri terminal, having the characteristics of meteor scattering. At 50 mc/s a link was operated between Jicamarca, Peru and Littleton, Massachusetts, but no firm evidence of reception was obtained. (Author)

AD-436 821 Div. 8
OTS price $1.10

Air Force Cambridge Research Labs., Bedford, Mass.
AN EXPERIMENTAL DETERMINATION OF ANTENNA PATTERN DISTORTION DUE TO A PLASMA LAYER,
by Daniel J. Jacavanco and Gerald Meltz. Jan 64, 11p.
Proj. 4642
AFCRL 64 18 Unclassified report

Descriptors: (*Antenna radiation patterns, Distortion), (*Distortion, Plasma medium), (*Plasma medium, Antenna radiation patterns), Measurement, Electromagnetic waves, Analysis, Plasma physics, Electrons, Density, Microwave equipment, Interferometers.

Measured radiation patterns of a plasma-covered antenna are compared with an approximate leaky wave analysis due to Oliner and Tamir. The results clearly show a shift in the optics ''critical angle'' and the appearance of several side lobes are predicted by theory. The plasma is produced in a He - Xe admixture at 0.4 torr by a capacitively-coupled 10-Mcps cw source and contained in a rectangular pyrex vessel of interior dimensions 8 in. by 4 in. by 5 in. Electron densities in excess of 5 x 10 to the 11th power per cc are measured by a standard microwave interferometer by manually balancing a bridge or automatically by displaying a set of interference ''fringes'' after a pattern is recorded. (Author)

AD-436 832 Div. 8
OTS price $8.60

Motorola Inc., Phoenix, Ariz.
SMALL SIGNAL SEMICONDUCTOR COMPOSITES.
Quarterly progress rept. no. 2, 1 Oct-31 Dec 63.
31 Dec 63, 93p.
Contract DA36 039AMC03212E
Unclassified report

Descriptors: (*Integrated circuits, Radio receivers), (*Radio receivers, Integrated circuits), Circuits, Semiconductors, Discriminators, Transistors, Audio amplifiers, Intermediate frequency, Frequency modulation, Electrical properties, Silicon, Intermediate frequency amplifiers, Gain, Distortion.

The parameter evaluation of devices with appropriate curves showing the results is reported. System considerations for an FM receiver are discussed along with descriptions of individual component development. (Author)

AD-436 858 Div. 8
OTS price $12.00

General Electric Co., Owensboro, Ky.
X-BAND TUBE-AND-CAVITY-COMBINATION OSCILLATOR.
Rept. no. 10 (Final), 1 May 61-30 Nov 63,
by J. M. Connelly and J. B. Quirk. 30 Nov 63
166p.
Contract DA36 039AMC02258E, Task 1G6 40909D513 05
Unclassified report

Descriptors: (*Oscillators, Design), (*Electron tubes, X band), Microwave oscillator, Triodes, Cavity resonators, Performance (Engineering), Tests, Life expectancy.

After a successful study of optimum triode integration into X-band circuitry and of high emission density oxide cathodes, triode oscillators for use at X-band (9.35-9.65 Gc) were designed, built and tested. Low over-all power drain (less than 5 watts) at a plate voltage of 150 V, light weight (less than 1 ounce), and simplicity of operation (single knob tuning) make them especially attractive when compared to more complicated existing devices. Since components and assembly are compatible with established production techniques, the design could be refined to a very economical product in a minimum time. Successful 500-hour life performance has been demonstrated. Novel heater-cathode techniques play a large part in making this performance possible. In addition, experimental triodes capable of generating 2 watts over the 9.3 to 9.6 Gc band have been demonstrated. Most of these have built-in resonators and adjustable grid-anode gaps that allow a CW-oscillator plate efficiency of 5% at X-band. (Author)

AD-436 871 Div. 8, 26
OTS price $2.60

Delco-Remy Div., General Motors Corp., Kokomo, Md.
PRODUCTION ENGINEERING MEASURE TO IMPROVE PRODUCTION TECHNIQUES AND INCREASE THE RELIABILITY OF THE 2N1358A TRANSISTOR.
Quarterly progress rept. no. 7, 30 Oct 63-30 Jan 64,
by J. C. Kuhns. 30 Jan 64, 25p.
Contract DA36 039SC86725
Unclassified report

Descriptors: (*Transistors, Production), Manufacturing methods, Surface properties,

Germanium, Crystal growth, Crystal lattice defects, Alloys, Indium, Failure (Mechanics), Reliability (Electronics), Tests, Storage.

This report is a review of the work during the seventh quarter, October 30, 1963, to January 30, 1964. During this quarter the sixth quarterly report was submitted. This report reviews the status of the evaluation programs on three of the process and equipment programs. Favorable results are now being attained with the unit size crystal growing facilities. Failure rates and graphs of parameter distributions of Milestone V tests are included in this report. The high temperature storage test results were excellent bettering the goal in the contract. The high stress operating life test results again showed improvement of both stability and failure rate. The report contains a discussion of the Final Proof Test program, and a section about special tests conducted to identify early turn-on failures on high-stress operating life tests. Results of the Milestone V failure analysis program are presented. (Author)

AD-436 875 Div. 8
OTS price $5.60

General Electric Co., Syracuse, N. Y.
TUNNEL DIODES FOR PHASED ARRAY RADAR.
Quarterly progress rept. no. 3, 20 Jan 64-10 Apr 64.
10 Apr 64, 56p.
Contract NObsr98328, Proj. SR0080301, Task 9349
Unclassified report

Descriptors: (*Tunnel diodes, Microwave amplifiers), (*Microwave amplifiers, Tunnel diodes), Circuits, Electrical properties, C-band, S-band, Germanium, Gallium alloys, Antimony alloys, Radar antennas, Noise (Radar).

Work continued on both the P-type germanium and gallium antimonide tunnel diode, exploiting the semiconductor-glass semiconductor (sandwich) technology. Not having developed a satisfactory bonding procedure for a gallium antimonide sandwich tunnel diode it was decided to concentrate on the germanium tunnel diode. P-type germanium tunnel diodes were made with a wide range of characteristics. The preliminary device specifications are established and tunnel diode assemblies being made to achieve the reproducibility desired. (Author)

AD-437 137 Div. 8
OTS price $3.60

Electronics Research and Development Agency, Fort Monmouth, N. J.
TE01 CROSS-GUIDE TRANSDUCER,
by N. Lipetz and C. Neudorfer. Oct 63, 38p.
Task 1G6 22001A057 02
AELRDL TR2389 Unclassified report

Descriptors: (*Transducers, Waveguides), (*Waveguide couplers, X-band), Standing wave ratios, Waveguide irises, Tables, Electrical impedance, Impedance matching, Radiofrequency power, Bandwidth.

An interest in the TE01 mode in circular waveguide as a transmission medium has greatly increased over the past few years because of its low loss and high power handling characteristics. Since most microwave generators are available only in a rectangular waveguide output, it is necessary that rectangular to circular waveguide transducers be made available for use in circular waveguide systems. Such a transducer was developed which is compact and exhibits a mode purity of greater than 22 db and a VSWR less than 1.2:1 over a 13% bandwidth centered at 7.5 Gc. The steps taken to achieve these objectives are described and the dimensions given of the final transducer. Included is a brief discussion of mode purity measuring techniques, as well as examples. (Author)

AD-437 167 Div. 8
OTS price $6.60

Sylvania Electric Products, Inc., Woburn, Mass.
PRODUCTION ENGINEERING MEASURE FOR GALLIUM ARSENDIE VARACTOR DIODE.
Quarterly progress rept. no. 7, 1 Dec 63-29 Feb 64,
by C. F. Davis, Jr. 29 Feb 64, 69p.
Contract DA36 039sc86736
Unclassified report

Descriptors: (*Varactor diodes, Gallium alloys), Arsenic alloys, Tests, Scheduling, Manpower studies, Test equipment, Reflectometers, Quality control, Test methods, Visual inspection, Failure (Mechanics), Resonance, Electrical impedance, Capacitance.

Pre-production gallium arsenide varactor diodes were tested to specification SCS-128 amendment 2 dated 29 Oct 1963. Two units failed. Analysis indicated certain remedial steps, which have been taken. Process and parts modifications are described and justified. Material and parts are being finalized for pilot production. (Author)

AD-437 186 Div. 8
OTS price $1.10

Army Electronics Research and Development Agency, Fort Monmouth, N. J.
ULTRA-LOW-DRAIN LOCAL OSCILLATORS AND MIXERS FOR S-, C-, X-, AND KU-BAND USE,
by L. E. Scharmann. Mar 64, 10p.
Task 1G6 22001A055 02 26
AELRDL TR2438 Unclassified report

Descriptors: (*Microwave oscillators, Design), (*Mixers, Design), Triodes, Waveguides, Circuits, S band, C band, X band, K band, Harmonic analyzers.

New methods are presented to accomplish local oscillator and mixer functions utilizing low-drain negative-grid tubes. Reduced total power input is emphasized. Design details and performance characteristics of oscillators, varactor multipliers, and harmonic detectors are given. (Author)

AD-437 189 Div. 8, 26
OTS price $3.60

Westinghouse Electric Corp., Philadelphia, Pa.
PRODUCTION ENGINEERING MEASURE TYPE 2N1814 SILICON ALLOY TRANSISTOR.
Quarterly progress rept. no. 2, 1 Oct-31 Dec 63,
by T. Csakvari, P. Kannam, G. Mellot, D. Moore and R. Pisarcik. 31 Dec 63, 31p.
Contract DA36 039AMC03617E
Unclassified report

Descriptors: (*Transistors, Manufacturing methods), (*Silicon alloys, Production), Reliability (Electronics), Diffusion, Soldering, Life expectancy, Encapsulation, Industrial equipment, Processing, Vacuum furnaces.

The status of all phases of the reliability improvement program is presented. Problems encountered during the fabrication of devices and procedures designed to eliminate the difficulties are presented. The method for determining failure rate for present product through the use of one-thousand hour operating life test is described. (Author)

AD-437 191 Div. 8
OTS price $1.60

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR IMPROVED RELIABILITY OF SOLID ELECTROLYTE TANTALUM CAPACITORS.
Quarterly rept. no. 1, 29 June-29 Sep 63,
by J. M. Eckfeldt and J. H. D. Folster.
29 Sep 63, 13p.
Contract DA36 039AMC03621E
Unclassified report

Descriptors: (*Tantalum capacitors, Reliability), Measurement, Performance (Engineering), Thin films (Storage devices), Determination, Crystallization, High temperature Research, Processing, Design, Failure (Mechanics).

This first quarterly progress report contains a discussion of the objectives of this contract and Sprague's approach to meeting them. Also provided is a description of progress to date, which includes an experimental matrix being run to determine the heat treatment effects on thin oxide films and the crystallization of these films at high temperatures, the starting of 10 experimental lots through the production process and work toward the mechanization of the assembly operation. Seven of the experimental lots incorporate variations from the standard processing techniques, while the other three are processed in the standard manner and serve as controls. All the lots are to be tested following manufacture to determine the effect of the process variations. The work on the mechanization of the assembly operation involves the design and construction of seven different equipments. The design and preparation of drawings for five of these seven equipments is completed. On the other two, it should be completed shortly. (Author)

AD-437 193 Div. 8
OTS price $1.10

Cooley Electronics Lab., Department of Electrical Engineering, University of Michigan, Ann Arbor.
STUDY AND INVESTIGATION OF A UHF-VHF ANTENNA.
Bimonthly rept. no. 7, 2 Jan-2 Mar 64,
by J. E. Herman and S. B. Rhee. Mar 64, 8p.
Rept. no. 5549 7P
Contract AF33 657 10607
Unclassified report

Descriptors: (*Spiral antennas, Very high frequency), (*Slot antennas, Ultra high frequency), Antenna configurations, Conical antennas, Antenna radiation patterns, Ferrites, Magnetic fields, Standing wave radios.

A comparison of theoretical and experimental beam patterns for the equiangular spiral will be available shortly. Preliminary tests of magnetic bias on the ferrite-filled rectangular slot indicate that the resonant frequency of the slot increases with increasing magnetic fields. Further tests of the effects of ferrite loading on VSWR and beam pattern for the log conical and log zig-zag antennas are being conducted. An extension of the frequency range of the antennas is indicated. (Author)

AD-437 196 Div. 8
OTS price $2.60

Whirlpool Corp., St. Joseph, Mich.
THERMOELECTRIC TEMPERATURE CONTROL IN AN/URQ-9 FREQUENCY STANDARD.
Interim development rept. no. 12, 1 Jan-31 Mar 64,
by A. L. Wennerberg. 15 Apr 64, 25p.
Contract NObsr85314, Task 9215
Unclassified report

Descriptors: (*Frequency stabilizers, Thermoelectricity), Control systems, Temperature control, Aging (Materials), Oscillators, Crystals, Crystal ovens, Substitutes.

Frequency measurements made on five low temperature 5 mc crystals are plotted to show their frequency stabilization period and long term aging characteristics. Long term drift rates of precision oscillators coupled to the low temperature crystals were found to be within several parts in 10 to the minus 11 power per day. Performance of the five oscillators after periods of shutdown are reported. (Author)

AD-437 230 Div. 8
OTS price $1.60

Hughes Aircraft Co., Culver City, Calif.
S- AND L-BAND FERRITE LIMITER PROGRAM.
Quarterly rept. no. 3, 1 Jan-31 Mar 60.
1 Apr 60, 15p.
Contract AF30 602 2019, Proj. 4506, Task 45358
Unclassified report

Descriptors: (*Microwave equipment, Limiters), (*Limiters, Microwaves), (*Ferrites, Limiters), S band, L band, Magnetic fields, Radiofrequency, Magnetic resonance, Materials.

The limiter program is directed toward the development of a practical microwave limiter for the S- and L-band regions by utilization of the nonlinear, high-power characteristics of ferrites. The design objectives call for a passive broadband device which should provide approximately 60 db of attenuation to high-power signals in the 100 kilowatt range and 1.0 db (or less) loss at low power (less than 75 mw). The areas of investigation were: (1) the effect of the ferrite limiter on the waveshape of the pulsed r-f power, (2) the selection of a suitable ferrite material, (3) the determination of an optimum ferrite-waveguide geometry, and (4) the effect of system environmental conditions on the operation of the ferrite limiter. (Author)

AD-437 266 Div. 8
OTS price $5.60

Technische Hochschule, Stuttgart, (Germany).
INVESTIGATIONS ON NOBLE GAS FILLED THERMIONIC ENERGY CONVERTERS,
by W. Bloss. 15 Aug 63, 53p.
Contract AF61 052 443
ARL 63 208 Unclassified report

Descriptors: (*Thermionic converters, Helium group gases), Thermionic emission, Effectiveness, Oscillation, Space charges, Gas ionization, Plasma physics, Electric discharges, Ions, Electrons.

Space charge compensation and the performance of a special noble gas filled thermionic converter are reported. Rf oscillations were investigated. Work function and emitter resistance were measured. Experimental investigations on the arc mode are summarized. (Author)

AD-437 273 Div. 8
OTS price $6.60

General Electric Co., Owensboro, Ky.
RESEARCH, DEVELOPMENT, AND FABRICATION OF TUNNEL EMISSION CATHODES.
Final interim technical rept. July-Nov 63,
by J. W. Hall. Nov 63, 68p.
Contract DA49 1860RD1053
Unclassified report

Descriptors: (*Cathodes (Electron tubes), Tunneling (Electronics)), (*Tunneling (Electronics), Metals), (*Metals, Manufacturing methods), (*Manufacturing methods, Production), Sandwich construction, Dielectrics, Aluminum, Aluminum compounds, Oxides, Vapor plating, Vacuum apparatus, Electrical properties, Temperature, Emissivity, Heat, Failure (Mechanics), Electron microscopy, Electron diffraction analysis.

Metal-insulator-metal (M-I-M) sandwiches have been studied as an electron source for possible use as a cathode in electron tubes. The M-I-M sandwich, which had an area of .01 sq. cm, consisted of an aluminum base layer, a thin layer of AL203, and a thin metal accelerator layer. The metal films were formed by vacuum evaporation, while the Al203 was formed by either solution anodization, gaseous anodization, thermal oxidation or evaporation of Al in an oxygen atmosphere. The best results were obtained by solution anodization in a 5% solution of tartaric acid. Twelve metals were investigated as accelerator layers for the Al-Al203 system with the most promising results obtained with gold. Experimental results are reported. The sandwiches were tested under both pulsed and D.C. conditions. Under D.C. conditions the heat energy generated caused the accelerator films to agglomerate, the oxide to break down, and promoted reactions between the films. Under pulsed conditions, with less average heat generated, the sandwiches operated at emission current densities of 200 ma/sq. cm for short periods and at low emission current densities for periods up to 100 hours with no apparent signs of degradation. (Author)

AD-437 277 Div. 8, 6
OTS price $5.60

Sylvania Electric Products Inc., Waltham, Mass.
MULTIPLE BEAM INTERVAL SCANNER.
Final rept.,
by Francis J. LaRussa. 23 Mar 64, 44p. Rept. no. F485 1
Contract AF19 604 7385, Proj. 4600, Task 460007
AFCRL 64 192, vol. 2 Unclassified report

Descriptors: (*Multiple beam antennas, Scanning), Electromagnetic lenses, Lens antennas, Wave guides, Transmission lines, Monopulse radar, Mechanical scanning, Phase shifters, Antenna lobes, Antenna radiation patterns, Interferometers.

AD-437 299 Div. 8
OTS price $2.60

Sperry Gyroscope Co., Great Neck, N. Y.
CIRCUITED AMPLIFIER DEVELOPMENT.
Interim technical documentary rept.
Mar 64, 21p. Rept. no. EB529 0419
Contract AF30 602 3102, Proj. 4506, Task 450603
RADC TDR64 87 Unclassified report

Descriptors: (*Radiofrequency amplifiers, Ultrahigh frequency), (*Tuned amplifiers, Radiofrequency amplifiers), Electron tubes, Ceramic capacitors, Radiofrequency power, Modulators, Transistors, Cavity resonators, Broadband, Life expectancy, Costs, Maintainability.

The development of an inexpensive circuited amplifier chain is being investigated. The chain is to be capable of peak power outputs of up to 100 kw at UHF (432 mc) with broadband (40 mc) capabilities. Flatplate and stripline cavity construction, and new techniques in fabrication inexpensive dc blocks and bypass capacitors were investigated. Tube types were evaluated for life and performance vs cost trade-offs. Ease of maintenance coupled with high component and amplifier reliability were major points of consideration. All unique features and technical advances were oriented to be compatible with mass production techniques providing phase-array cavity hardware at minimum cost. (Author)

AD-437 300 Div. 8
OTS price $11.00

Sperry Microwave Electronics Co., Clearwater, Fla.
ISOLATORS, RADIO FREQUENCY REFLECTION CU- ( )/U DUPLEXERS CU ( )/U AND HIGH POWER CIRCULATORS.
Final rept.
Mar 64, 139p. Rept. no. SJ224 00012C
Contract AF30 602 1630, Proj. 4506, Tasks 45743; 450602
RADC TDR64 27 Unclassified report

Descriptors: (*Switching circuits, Ferrites), (*Ferrites, Ultrahigh frequency), (*Radar duplexers, Ferrites), Garnet, Yttrium, Iron, Phase shifters, Waveguides, Ferromagnetic materials, Design, Microwave equipment, Microwave frequency, Materials, Coaxial cables, Performance (Engineering), Resonance absorption, Electromagnetic filters, Coaxial filters, Permeability, Electric fields, Magnetic fields, L band, Transmitter-receivers, Resonators.

A series of ferrite duplexers and isolators were developed for operation in the 400 to 2000 mc region. The first phase was a feasibility study at low power levels in which ferrite material processing techniques and microwave performance capabilities were investigated. The second phase utilized the information generated in the first phase to develop additional components for high power applications. Differential phase shift duplexers in WR-1800 and WR-975 waveguide, and an octave bandwidth resonance isolator in 7/8-in. coaxial line were developed in connection with the feasibility study of Phase I. Additional differential phase shift duplexers in WR-975 and WR-2100 waveguide were designed in Phase II, along with WR-650, WR-975 and WR-1500 resonance isolators. (Author)

AD-437 311 Div. 8, 32, 25
OTS price $3.60

Hughes Aircraft Co., Culver City, Calif.
LEAD TELLURIDE DATA SHEETS,
by M. Neuberger. Oct 62, 35p. Rept. no. DS113
Contract AF33 616 8438, Proj. 7381, Task 738103
Unclassified report

Descriptors: (*Semiconductors, Physical prop-

erties), Documentation, Lead alloys, Tellurium alloys, Tellurides, Experimental data, Electromagnetic properties, Electrical properties.

The Electronic Properties Information Center has been established to collect, index and abstract the literature on the electrical and electronic properties of materials and to evaluate and compile the experimental data from that literature. A modified coordinate index to the literature is machine stored and printed for manual use. The Center publishes data sheets, summary reports, thesauri, glossaries, and similar publications as sufficient information is evaluated and compiled. This report consists of the compiled data sheets on Lead Telluride used as a semiconductor. (Author)

AD-437 313 Div. 8, 32
OTS price $1.60

Sylvania Electric Products, Inc., Waltham, Mass.
GROUND ELECTRONICS SYSTEM FOR WS-133B (MINUTEMAN) DOCUMENTATION INDEX.
31 Mar 64, 15p. Rept. no. MPO SR11 4 403
Contract AF04 694 261
Unclassified report

Descriptors: (*Indexes, Documentation), (*Electronics, Documentation), Ground support equipment.

AD-437 324 Div. 8
OTS price $16.00

Bhimani Research Associates, Lexington, Mass.
MULTIDIMENSIONAL MODEL FOR AUTOMATIC SPEECH RECOGNITION.
Final rept.,
by B. V. Bhimani. 14 Feb 64, 246p.
Contract AF19 628 2766, Proj. 4610, Task 461002
AFCRL 64 85 Unclassified report

Descriptors: (*Speech recognition, Analysis), (Speech, Analysis), Acoustic properties, Automatic, History, Language, Theory, Acoustics.

A theoretical basis is provided for a general purpose speech recognizer. The research has focused upon the nature of normal speech, which can be distinguished from discrete articulation by the continuous movement (in normal speech) of articulators from one position to another; as a result, sounds in continuous speech are more likely to modify the production of surrounding sounds than they are in discrete speech. Assuming that, according to the ergodic theory, sound changes occurring in everyday speech reflect and repeat the changes occurred in the historical development of language (because the physical modes of speech production are the same), linguistic examples and theories of sound change were studied. From this study, a body of rules for sound change or euphonic combination was derived and their applicability to the English language tested. These rules represent an error-correcting code to restore omitted or indefinite word boundaries and/or to restore the orthographic phone classes which are altered in continuous speech. The study required the evaluation of existing research and theories, as well as the generation of some original data, the latter consisting of high-quality recordings of continuous speech samples. Both original data and previously published data were subjected to acoustic analysis of minute portions of the speech waveform. (Author)

AD-437 329 Div. 8
OTS price $2.60

Aerospace Corp., Los Angeles, Calif.
ELECTRONICS PROGRAM. RADIO FREQUENCY INTERFERENCE AT ORBITAL ALTITUDES.
Semiannual technical rept., 1 July-31 Dec 63,
by K. H. Hurlbut and C. J. Zamites. 20 Mar 64,
29p. Rept. no. TDR269 4250 44 1
Contract AF04 695 269
SSD TDR64 33 Unclassified report

Descriptors: (*Radiofrequency interference, Monitors), (*Satellites (Artifical), Radiofrequency interference), Very high frequency, Video amplifiers, Diodes, Impedance, Ultrahigh frequency, Crystal video receivers, Band pass filters, Circuits, Spaceborne, Phased arrays.

Laboratory development of a compact, lightweight receiving system in the 200 to 1000 Mc band was initiated. (Author)

AD-437 343 Div. 8
OTS price $6.60

Westinghouse Electric Corp., Baltimore, Md.
FAILURE MECHANISMS IN MICROELECTRONICS.
Mar 64, 61p. Rept. no. 385A1
Contract AF30 602 3017, Proj. 5519, Task 551906
RADC TDR63 425 Unclassified report

Descriptors: (*Molecular electronics, Failure (Mechanics), Performance (Engineering), Processing, Quality control, Crystal structure, Silicon compounds, Dioxides, Oxides, Signal-to-noise ratio, Semiconductor devices.

A screening technique by which unreliable devices may be culled prior to completion of fabrication is described. The initial stage of an investigation of SiO2 passivation layers and of process damage which may occur during the fabri- a typical semiconductor device is presented. (Author)

AD-437 344 Div. 8
OTS price $1.60

TYCO Labs., Inc., Waltham, Mass.
STUDY OF SURFACE STATES IN SEMICONDUCTORS.
Quarterly rept. no. 2,
by G. Rupprecht, J. Gilbert and T. H. Bergeman.
Mar 64, 19p.
Contract AF30 602 3157, Proj. 5519, Task 551906
RADC TDR64 17 Unclassified report

Descriptors: (*Semiconductors, Surface properties, (*Gallium compounds, Arsenides), (*Conductivity, Measurement), *Impurities, Zinc, Electron capture, Temperature, Silicon, Oxides, Voltage, Resistance (Electrical), Etched crystals.

Surface states on GaAs have been studied by the pulsed field effect experiment. The surfaces under investigation were (111) surfaces, the so called A and B surfaces which are terminated by gallium and arsenic, respectively. With zinc-doped P-type GaAs, a surface state was found to on the B surface 0.53 eV above the valence band with a capture cross-section for holes of about 3 x 10 -12th power sq, which is indicative of an acceptor state. (Author)

AD-437 348 Div. 8
OTS price $5.60

General Dynamics/Electronics, Rochester, N. Y.
COMMUNICATION AND INFORMATION THEORY ASPECTS OF THE NERVOUS SYSTEM.
Annual summary rept., 1 Oct 62-30 Sep 63,
by E. Agalides. 30 Sep 63, 57p.
Contract AF49 638 1185
AFOSR 64 0825 Unclassified report

Descriptors: (*Communication theory, Nervous system), (*Nervous system, Communication theory), (*Models (Simulations), Nerve cells), Piezoelectric transducers, Biophysics, Coding, Instrumentation, Circuits, Bionics, Circuits, Probability.

Table of Contents: Multicoding-Unichannel and Multicoding-Multichannel Coding Theories of the Nervous System; Stimuli Transmission by the Giant Axon of Cambarus and Homarus Americanus; Neuron Simulators; Electromechanical Stimulator for Exerting Pressure on Skin Sensory Receptors; Piezoelectric Mechanical Transducer System and Terminology Used in Shannon's Theorem.

AD-437 353 Div. 8
OTS price $10.10

Microwave Associates Inc., Burlington, Mass.
HANDBOOK ON HIGH POWER CAPABILITIES OF WAVEGUIDE SYSTEMS.
by M. Gilden and L. Gould. June 63, 130p.
Contract NObsr85190
Unclassified report

Descriptors: (*Waveguides, Handbooks), (*Electrical properties, Waveguides), Power, Electric discharges, Gases, Dielectrics, Dielectric properties, Temperature, Standing wave ratios, Physical properties, Heat transfer, Tables, Performance (Engineering), Configuration, Failure (Mechanics).

The high power capabilities of waveguide systems are specified, for the commonly used waveguide modes of propagation, in terms of electrical breakdown at high peak powers and excessive temperature rise at high average power. The material includes the characteristics of various gases and the effects of such factors as pulse length, repitition rate, gas temperature, harmonics, spurious modes and standing waves. Also included are the effects resulting from nonuniform conditions in electric field and gas which the values of power can be readily obtained. A section also discusses the problems associated with reducing the likelihood of the occurrence of failures in high power waveguide systems. (Author)

AD-437 360 Div. 8
OTS price $2.60

Radio Corporation of America, Harrison, N. J.
A LOW-NOISE, MULTIPLE-FUNCTION, X-BAND TRAVELING-WAVE TUBE.
Interim development rept. no. 7, 1 Dec 63-31 Jan 64,
by G. Hodowanec and R. McMurrough. 27 Feb 64, 27p.
Contract NObsr87535, Proj. SR008 03 04, Task 9293
Unclassified report

Descriptors: (*Traveling wave tubes, X-band), Microwave amplifiers, Electron guns, Electron tube parts, Video amplifiers, Helixes, Focusing, Magnets, Magnetic fields, Gain, Waveguides, Electron beams, Specifications.

This report describes the work done in a program to design and develop a low-noise, multiple-function, X-band traveling-wave tube. As was indicated in Interim Development Report No. 6 (actually a Status Letter), no work had been done during the period 1 September to 30 November 1963 because of the pending redirection in the scope of the program. One of the items in this redirection that was made is a change in the three objective specifications for the tube that have to do with (1) gain of the linear ouput, (2) flatness of the limited output, (3) video output. Included in this report is a summary of the status of the original program, the performance of the tubes of interim design fabricated during this phase, and the work done from 1 December 1963 to 31 January 1964 on the tube of revised design. (Author)

AD-437 399 Div. 8, 25
OTS price $13.00

Motorola Inc., Phoenix, Ariz.
RESEARCH AND DEVELOPMENT FOR SURFACE PROTECTION OF SEMICONDUCTOR DEVICES.
Final rept.,
by M. A. Hall, H. W. Cooper and S. S. Flaschen.
14 Dec 63, 188p.
Contract AF19 604 8358, Proj. 5621
AFCRL 64 188 Unclassified report

Original contains color plates: All reproductions will be in black and white. Original may be seen in DDC hdq.

Descriptors: (*Semiconductor devices, Surface properties), Silicon, Oxides, Glass, Oxidation, Transistors, Crystal substructure, Impurities, Moistureproofing, Recombination reactions, Tables.

Effort was concentrated in analyzing, understanding and controlling phenomena at or near semiconductor surfaces so that the level of device technology would be raised. A controlled ambient program, controlling the atmosphere in the package above the semiconductor surface, stabilized and also optimized the electrical parameters of the devices. This was accomplished by controlling the concentration and distribution of water molecules at the surface in the vicinity of the junction. Various glasses, prepared by sputtering and various other means, were used to provide a relatively impermeable barier to intimately seal the surface and junction areas. The electrical qualifications of the glasses also were determined to ensure that they would enhance and protect the devices rather than limit them. The carier states at the surface of the semiconductor were effectively controlled and stabilized by both surface solution treatments as well as controlled ambient techniques. Understanding and control of semiconductor properties beneath the surface was developed in the study of accelerated oxidation passivation of silicon transistors. Oxidation induced dopant redistribution effects were also studied in this program. (Author)

AD-437 495 Div. 8
OTS price $5.60

Coordinated Science Lab., Univ. of Illinois, Urbana.
SUPPRESSION OF NOISE EFFECTS IN PULSE WIDTH MODULATED SYSTEMS.
by H. J. Stein. Jan 64, 55p. Rept. no. R190
Contract DA36 039AMC02208E, Proj. 3A99 25 004
Unclassified report

Descriptors: (*Pulse modulation, Noise (Radio)), (*Noise (Radio, Pulse modulation),

Control systems, Sampling, Feedback, Equations, Probability, Mathematical analysis, Statistical processes.

Investigation is made of a sampled data feedback system, consisting of a lead type pulse width modulator, a general (n-th order), linear, time-invariant plant, and unity feedback. The closed loop system is assumed to be stable, and it is assumed that plant time constants are of the order of, or shorter than, the pulsing period. The modulator is assumed to be imperfect (noisy), in that it emits pulses, the durations of which differ from the correct values. The deviation of the pulse width is assumed to be a Gaussian random variable with zero mean and a given standard deviation, and it is assumed that there is no correlation between samples at different sampling instants. Equations are derived which predict the probability distribution of the plant output after any number of sampling instants. (Author)

AD-437 496 Div. 8
OTS price $4.60

Little, Arthur D., Inc., Cambridge, Mass.
METHODS FOR LOW POWER TEMPERATURE CONTROL.
Quarterly rept. no. 3, 1 Nov 63-31 Jan 64,
by Igor A. Black and John Peterson. 31 Jan 64, 43p.
Contract DA36 039AMC02207E, Task 1G6 22001A058 02
Unclassified report

Descriptors: (*Crystal ovens, Temperature control), (*Thermostats, Miniature electronic equipment), Quartz, Crystal holders, Seals (Stoppers), Heaters, Design, Crystals.

An investigation was made of methods, techniques, and devices by which the temperature of a quartz crystal can be maintained, with a minimum of power, at a nominal operating temperature over environmental temperature extremes. The work includes investigation of second-order effects applicable to the design of low-power crystal ovens. End products resulting from the study are three types of ovens: a 3-cu in., 500-milliwatt oven (Type J6) requiring accessibility to the crystal and operating at +75 C ± 1 C over a -55 C to +60 C ambient; a 3-cu in., reduced power, sealed oven (Type K6G) with similar operating requirements; and a 4-cu in., 250-milliwatt oven (Type L6) requiring accessibility to a chamber capable of housing two crystals and operating at 0 C ± 1 C over a -55 C to 0 C ambient. (Author)

AD-437 587 Div. 8, 12
OTS price $10.10

Institute of Science and Tech., Univ. of Michigan, Ann Arbor.
AN EXPERIMENTAL STUDY OF RAPID PHASE FLUCTUATIONS INDUCED ALONG A SATELLITE - TO EARTH PROPAGATION PATH,
by Leonard J. Porcello. Apr 64, 125p. Rept. no. 4563 57T
Contract AF33 616 8365
Unclassified report

Descriptors: (*Satellites (Artificial), Radio waves), (*Radio waves, Phase shift), Earth, Propagation, Frequency, Radio frequency oscillators, Measurement, Phase-locked systems, Radio receivers, Electric filters, Equations, Bandwidth, Antennas, Phase measurement, Radio frequency spectroscopy, Ionosphere, Analog computers, Electron density, Errors, Ultra-high frequency, Very high frequency, Wave transmission.

An experiment is described which has as its objective the examination of high-frequency phase fluctuations induced by the atmosphere along a satellite-to-ground propagation path. The phase fluctuations of interest lie in a spectral band ranging from approximately 0.1 cps to a maximum of 3 kc; the radio frequencies employed range from 54 to 400 Mc. The ionosphere-induced component of the observed phase fluctuation is of primary interest. Two classes of measurement are discussed; the first relies only upon use of a single highly stable sinusoidal emission from the satellite, whereas the second requires the emission of two harmonically related sinusoids, coherent with each other. (Author)

AD-437 624 Div. 8, 30
OTS price $23.50

Texas Instruments, Inc., Dallas.
MANUAL FOR POLYMODAL VOCODER. VOLUME II. SECTION V. DRAWINGS.
Final rept., Pt. 2.
Aug 63, 473p. Rept. no. HB18A63
AFCRL 63 301, Pt. 2 Unclassified report

Descriptors: (*Speech representation, Coding), Mechanical drawings, Instruction manuals, Computer logic, Transistors, Circuits, Speech transmission.

This section of the manual contains circuit board layouts and electronic and logic drawings for the circuits in the vocoder. Schematic drawings for the switches and jacks are also included. (Author)

AD-437 653 Div. 8
OTS price $4.60

Texas Instruments Inc., Dallas, Tex.
TECHNIQUES FOR EXPERIMENTAL FABRICATION OF A 1-WATT, 1-GC GALLIUM ARSENIDE TRANSISTOR.
Quarterly progress rept. no. 5 for 1 Aug-31 Oct 63,
by Melvin Belasco, E. C. Wurst and R. C. Sangster.
31 Oct 63, 41p. Rept. no. 08 63 157
Contract AF33 657 8757
Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Gallium alloys, Arsenic alloys, Impurities, Zinc, Diffusion, Silicon compounds, Oxides, Capacitance, Measurement, Temperature, Gain, Ultrahigh frequency, Life expectancy, Tellurium, Epitaxial growth, Tin alloys, Aluminum alloys, Tracer studies.

Gallium arsenide transistors with zinc-diffused base structures were built during this quarter. These transistors were built on both melt-grown and n on n epitaxial gallium arsenide. The common emitter current gain cutoff frequency of the transistors was between 300 and 700 mc. The dc current gain was tipically 7, with many ranging up to 20 and 30. Gallium arsenide transistors were also fabricated from p on n epitaxial material. These devices featured uniformly high values of h sub FE, typically 25. The f sub t's were on the order of 80 mc. Transistors were also made using an evaporated emitter stripe geometry on Zn-diffused GaAs. The high temperature (200 C) characteristics of a number of Zn transistors were studied during the quarter. Fifty state-of-the-art Zn-diffused devices have been placed on life test. Radiotracer studies on zinc diffusion show that the shallow junction depth and low surface concentrations needed for an evaporated stripe structure are obtainable with diffusions from SiO2 films. Tracer work on n-type impurity diffusion in GaAs was continued using S35 as a

source impurity for diffusion work through oxide films. Junction capacitance vs applied voltage studies have been made on Zn-diffused diodes to double-check the impurity profiles. Similar measurements were also made on Te diodes. (Author)

AD-437 672 Div. 8, 25
OTS price $9.10

Antenna Lab., California Inst. of Tech., Pasadena.
MICROWAVE INTERACTION WITH BOUNDED GYROELECTRIC PLASMAS,
by Elliott R. Nagelberg. Apr 64, 110p. Rept. no. TR 31
Contract AF49638 1266
AFOSR 64 0803 Unclassified report

Descriptors: (*Plasma medium, Microwaves), (*Microwaves, Plasma medium), Magnetic fields, Static electricity, Perturbation theory, Cylindrical bodies, Spheres, Electrons, Motion, Equations, Dielectrics, Scattering, Electromagnetic waves, Wave transmission, Plasma physics, Polarization.

The interaction of microwaves with gyroelectric plasmas of finite extent was investigated, particularly those having cylindrical or spherical boundaries. Within the latter class of problems, only those involving the axially magnetized column with circular cross section are amenable to rigorous analysis. It was found that one of the important effects of the anisotropy is to induce changes in the polarization of the scattered field resulting from interaction with an obliquely incident plane wave. As a means of solving problems which involve uniform but arbitrarily directed magnetization, the peturbation theory of microwave interaction in which the static magnetic field is regarded as a small perturbation of the isotropic plasma was developed. The field equations are derived for all orders but only those of first order, linear in the magnitude of the static magnetic field, are solved. This solution is carried out in general, the only restriction being that the fields for the isotropic problem are assumed to be known. The first order theory is then applied to cylindrical and spherical problems. When the approximate solution for the axially magnetized column is compared with the exact result, agreement is obtained provided that the static magetic field is weak, as expected. Finally, the problem of a magnetic dipole radiating from within a weakly magnetized plasma sphere is considered. (Author)

AD-437 683 Div. 8
OTS price $2.60

Harshaw Chemical Co., Cleveland, Ohio.
RESEARCH ON PHOTVOLTAIC CELLS.
Quarterly progress rept. no. 6, 1 Aug-31 Oct 63,
by Norman E. Heyerdahl, Roger F. Belt, Donald J. Harvey and James C. Schaefer. Nov 63, 25p.
Contract AF33 657 7916, Proj. 7885, Task 7885 02
Unclassified report

Report on Semiconductor Research.

Descriptors: (*Photoelectric materials, Semiconducting films), (*Semiconducting films, Photoelectric materials), Solar cells, Cadmium alloys, Tellurium alloys, Selenium alloys, Zinc alloys, Gallium alloys, Arsenic alloys, Vapor plating, Resistance (Electrical), Thermocouples, Glass, Molybdenum, Impurities, Impregnation, Indium, Silver, Photomicrography, X-ray diffraction analysis.

CdTe and GaAs films of low resistivity have been successfully formed by coevaporation on a variety of substrates. This report discusses these CdTe and GaAs thin films and it is proposed that the total effort of the contract now be exerted upon the preparation of CdTe thin film solar cells with the proviso that should this not prove feasible the effort will be switched to GaAs. It is felt that more rapid progress can be made at this point by such a procedure. During the past quarter a number of experiments have been performed as part of this overall program. They may be conveniently organized into three groups: film preparation, photovoltaic barrier properties and x-ray studies. GaAs and CdTe films have been prepared by coevaporation and doped by simultaneous deposition of dopant vapor. These films exhibit low resistivity but make a high resistance contact with molybdenum. The spatial and temporal variation of substrate temperature has been examined with thin film thermocouples and tentative results are given. (Author)

AD-437 694 Div. 8
OTS price $9.60

Sperry Gyroscope Co., Great Neck, N. Y.
HIGH-POWER X-BAND AMPLIFIER SAX-195 DEVELOPMENT.
Final technical rept.,
by C. Burklund and A. S. Ferello. Oct 63, 119p.
Rept. no. NA8240 8369
Contract AF30 602 2526, Proj. 5573, Task 557303
RADC TDR64 1 Unclassified report

Descriptors: (*Microwave amplifiers, X-band), Klystrons, Bandwidth, Cavity resonators, Electron guns, Magnets, Performance (Engineering), Waveguides), Configuration, Heat transfer, Waveguide windows, Production, Effectiveness.

Five types of extended interaction resonators were investigated. These are: parallel rod Chu resonators, 45-degree Chu resonators, 90-degree Chu resonators, folded waveguide resonators, and space harmonic coupled cavity circuits. Of these, the latter two proved best. One diode was tested. While 98-% transmission was obtained with 3.5 times Brillouin field, test data indicate a high degree of beam scalloping was present. Tube EX-2, containing 45-degree Chu circuits in resonators 1, 2, and 3, a parallel rod Chu circuit in resonator 4, and a standard tunable output cavity, was constructed. Only d-c data were obtained from this tube. Tube EX-3, containing 90-degree Chu circuits in resonators 1, 2, 3 and 4 and a standard tunable output cavity, was constructed and tested. Tube EX-3 also contained improved magnetic entrance conditions. Resonators 1, 2, and 3 monotron-oscillated because of an inadequately loaded mode below the operation band. (Author)

AD-437 700 Div. 8, 26
OTS price $3.60

Crystalonics, Inc., Cambridge, Mass.
PRODUCTION ENGINEERING MEASURE TO IMPROVE PRODUCTION TECHNIQUES AND TO INSURE THE RELIABILITY OF THE C600 SERIES FIELD EFFECT TRANSISTORS.
Quarterly rept. no. 2, 1 Oct-31 Dec 63,
by John R. Williams. 31 Dec 63, 39p.
Contract DA36 039AMC01483E
Unclassified report

Descriptors: (*Transistors, Manufacturing methods), Production, Furnaces, Oxidation, Thickness, Temperature, Welding, Ultrasonic radiation, Bonding, Chemical milling.

The effects of furnace temperature, time, water temperature, and flow rate upon oxidation thickness were studies. The effect of these parameters

upon diode characteristics was also investigated. A K & S Model 447 nailhead bonder was adopted for use with the Ultrasonic Welder. Devices were fabricated with the new setup. New masks providing for internal shorting of the grids were received. Devices were sucessfully fabricated using this technique. A final design for the mesa etching fixture was fabricated. (Author)

AD-437 747 Div. 8
OTS price $2.60

Warnecke Electron Tubes, Inc., Des Plaines, Ill.
STUDY OF INTERACTION STRUCTURES LEADING TO DEVELOPMENT OF X-BAND CROSSED-FIELD AMPLIFIER.
Quarterly progress rept. no. 3, 28 Dec 63-28 Mar 64.
24 Apr 64, 23p.
Contract NObsr89504, Proj. SF0100201, Task 9294
Unclassified report

Descriptors: (*Crossed field devices, Microwave amplifiers), (*Microwave amplifiers, Crossed field devices), X band, Bandwidth, Delay lines, Radiofrequency power, S band, Ceramic metals, Aluminum compounds, Oxides, Photoengraving, Waveguides, Waveguide couplers, Cooling, Sapphires, Titanium, Beryllium compounds, Tests.

Research concerns development of an X-band crossed-field amplifier having a delay ratio of 20 in the center of the band, in order to insure the attainment of the necessary 7- to 11- KMCS bandwidth. Further, the line must be capable of dissipating 3 to 4 kilowatts of power, which it will be called on to handle in order to be useful in a crossed-field amplifier tube giving 2 kilowatts of CW power. The line which was studied for this requirement is a multiple meander line, which is called a fenced line. S-band fenced lines were constructed on ceramic by photoforming techniques. An S-band fenced line was constructed having a delay ratio of 20 and a pitch about 3 times smaller than the initial photoformed lines. The dispersive characteristics of this line were measured and tests to determine its other characteristics are continuing. In addition, construction of an X-band line, scaled from the S-band line, was started, using photoforming techniques developed as another portion of the study. (Author)

AD-437 776 Div. 8
OTS price $4.60

University of Southern California, Los Angeles,
SOME STATISTICAL PROPERTIES OF ELECTROMAGNETIC NOISE,
by D. G.Childers and I. S. Reed, Feb 64, 41p.
Rept. no. EE 107
Contract AF04 695 304, Proj. 3182 730F, Task 02
SSD TDR64 70 Unclassified report

Descriptors: (*Noise (Radar), Models (Simulations)), Radiofrequency interference, Design, Radar receivers, Theory, Polarization, Isotropism, Communication systems, Polarization, Dipole antennas, Radar antennas, Detection, Density, Correlation techniques.

The importance of designing a radar (or communications) receiver to operate effectively in the presence of spatial noise creates the necessity for developing a theoretical representation of the noise which can be used for the evaluation of various detection techniques. Such a representation for a general, polarized, nonisotropic noise process is formulated here. This representation is used to determine the cross-spectral densities and cross-correlation functions between antenna array elements in the presence of the noise field only. Results for unpolarized noise are also obtained. One important result is that the noise cross-correlation is shown to be a function of the receiver element spatial orientation when the elements are dipoles. For certain spatial orientations between dipoles it is possible to reduce the nosie cross-correlation between these antenna array elements to zero. This result should prove useful in future antenna design. (Author)

AD-437 777 Div. 8
OTS price $7.60

Space General Corp., El Monte, Calif.
EXPERIMENTAL RESEARCH INVESTIGATION OF EXTREMELY LOW FREQUENCY PROPAGATION.
Final rept.
by G. R. Dunn, P. F. Kuhnle and R. D. Smith.
28 Feb 64, 75p. Rept. no. 212R8
Contract AF19 628 1603, Proj. 4603, Task 460313
AFCRL 64 164 Unclassified report

Descriptors: (*Electromagnetic waves, Extremely low frequency), (*Propagation, Electromagnetic waves), (*Extremely low frequency, Electromagnetic waves), Antennas, Transmission lines, Attenuation, Noise (Radio), Radio transmitters, Radio receivers, Electric fields, Ionospheric propagation, Instrumentation, Recording systems, Electrical properties.

Characteristics of ELF electromagnetic wave propagation were investigated by measuring the characteristics of CW signals transmitted over a 400 cps link, over a distance of 3000 km. A 67-mile section of power transmission line was used to radiate the 400 cps energy. Data which could be reduced to yield signal strength, attenuation rate, transmission path phase variations, and atmospheric noise amplitude probability distributions (APD) were recorded at the receiver site. The measured attenuation rate was 3.5 db/1000 KM for a nighttime path and 9 db/1000 KM for a daytime path. Reduction and analysis of the transmission path phase data showed sunrise diurnal phase variations ranging from 150 to 200 degrees. Measurements are compared with path characteristics calculated using existing theoretical treatments of ELF propagation. Atmospheric noise data were recorded for all transmission periods. Samples of these data are presented in the form of amplitude probability distributions and impulses per unit time distributions. Performance measurements and calculations for the power line transmitting antenna are presented. (Author)

AD-437 793 Div. 8
OTS price $8.10

Electron Physics Lab., Univ. of Michigan, Ann Arbor.
BASIC RESEARCH IN MICROWAVE DEVICES AND QUANTUM ELECTRONICS.
Quarterly progress rept. no. 3, 1 Nov 63-1 Feb 64, by H. K. Detweiler, M. E. El-Shandwily, B. Ho, J. E. Rowe and C. Yeh. Mar 64, 85p. Rept. no. 05772 3P
Contract NObsr89274, Projs. SR0080301; OAR 05772, Task 9391
Unclassified report

Descriptors: (*Masers, Production), (*Traveling wave tubes, Production), (*Pumping (Electronics), Production), Frequency multipliers, Feedback, Helixes, Tungsten, Electron beams, Gain, X band, Electric fields, Electrostatic fields, Dielectrics, Cyclotrons, Amplitude

modulation, Phase modulation, Research program administration, Mathematical analysis, Electron guns, Cavity resonators.

Generation and Amplification of Coherent Electromagnetic Energy in the Millimeter and Submillimeter Wavelength Region; An experimental low-frequency model of the frequency multiplier has been designed. A scheme of feedback to enhance the transfer efficiency is included. The tube is in the final stage of assembly and alignment. Difficulties in loading a helix designed to operate at 30 Gc into a BeO tube have not been fully resolved. Experimental data indicates that a material having a higher resiliency than tungsten should be used for the helix. Analysis of Amplitude-and Phase-Modulated Traveling-Wave Amplifiers; The analysis of the operation of the TWA with a multi-frequency input has been extended to account for the multivalued nature of the electron velocity in the beam. Boltzmann's transport equation is used to describe the kinematics of the electron beam. Study of a D-c Pumped Quadrupole Amplifier; A comprehensive study of the coupling mechanism between the various modes of operation of a d-c pumped transverse wave device has been made by means of the coupled-mode theory. (Author)

AD-437 812 Div. 8
OTS price $3.60

Sperry Gyroscope Co., Great Neck, N.Y.
TRAVELING-WAVE-TUBE MIXER.
Final rept., 1 Apr 61-31 May 63,
by L. Magill. Mar 64, 37p. Rept. no. NA8220 8366
Contract AF33 616 8074, Proj. 4156, Task 415604
RTD TDR63 4217 Unclassified report

Descriptors: (*Traveling wave tubes, Mixers), (*Mixers, Traveling wave tubes), (*X-band, Mixers), Helixes, Bandwidth, Molybdenum, Production, Ceramic materials, Brazing, Machining, Electron guns, Magnetic fields, Glass, Temperature, Focusing.

Results are described for a two-helix traveling-wave-tube mixer capable of operation from 50 to 60 Gc. An experimental X-band mixer was constructed in a glass shell, but never tested because of difficulties in achieving satisfactory coupling. Lack of program time led to termination of work on this device and the initiation of design and construction of the full-frequency mixer. A full-frequency traveling-wave-tube mixer--having low ka, high frequency, low voltage, and wide bandwidth--was designed. The primary technical difficulty arose from the use of molybdenum in the tube shell and support structure. Molybdenum solved the problem of thermal-expansion differences between the tube shell and ceramic supports, but made brazing, plating, and machining difficult. All brazing efforts failed, so a device was constructed and sealed by means of an epoxy adhesive. (Author)

AD-437 818 Div. 8
OTS price $8.10

SFD Labs., Inc., Union, N. J.
DEVELOPMENT OF AN X-BAND CW CROSSED-FIELD AMPLIFIER.
Interim Development rept., 31 Dec 63-31 Mar 64,
by M. Arnum. 28 Jun 63, 86p. Rept. no. 33IDR3
Contract NObsr89503
Unclassified report

Descriptors: (*Crossed field devices, X-band), Microwave amplifiers, Tests, Electrical impedance, Impedance matching, Coils, Anodes (Electron tubes), Transmission lines, High-pass filters.

Slow wave structures, namely the choke supported and the plain reactively loaded interdigital lines, capable of meeting the objective specifications of the program, were evaluated at cold test. The choke supported interdigital line structure, evaluated earlier, was abandoned. Emphasis was placed on obtaining comparative electronic interaction impedance values for the two circuits and on obtaining an acceptable circuit impedance match across the desired frequency band. Two circuit impedance matching schemes were investigated. Of importance is the fact that the plain reactively loaded interdigital line structure shows an apparent coupling impedance two to three times that of the choke supported version. Construction of tubes incorporating these slow wave structures for hot test evaluation is in progress. (Author)

AD-437 824 Div. 8, 6
OTS price $8.10

Univ. of Southern California, Engineering Center, Los Angeles.
OPTIMUM SIGNAL PROCESSING IN THE PRESENCE OF SPATIAL NOISE,
by D. G. Childers and I. S. Reed. Mar 64, 88p.
USCEE Rept. 108
Contract AF04 695 304, Proj. 3182 730F
SSD TDR64 127 Unclassified report

Descriptors: (*Radar, Detection), (*Noise (Radar), Sonar), Theory, Stochastic processes, Optimization, Radar echo areas, Antenna configurations, Phased arrays, Polarization, Statistical analysis, Dipole antennas, Scattering, Signal-to-noise ratio, Fourier analysis, Integral transforms.

An optimum signal processing theory for active radar (sonar) arrays is developed. Both discrete and continuous arrays (apertures) are considered. An optimum linear processor is developed which maximizes the output signal-to-noise ratio when the input is a known signal imbedded in correlated and uncorrelated noise. The signal processing theory requires a knowledge of some of the statistical properties of the noise field. Therfore, a stochastic representation for a general, polarized, nonisotropic noise process is formulated. This representation is used to determine the cross-spectral densities and cross-correlation functions between antenna array elements in the presence of the noise field only. (Author)

AD-437 869 Div. 8
OTS price $2.60

Harry Diamond Labs., Washington, D.C.
AN ALL-SEMICONDUCTOR COMMUTATOR,
by Robert Goings. 15 Oct 63, 25p.
Proj. 40300
HDL TR1149 Unclassified report

Descriptors: (*Electronic commutators, Semiconductor devices), (*Semiconductor devices, Electronic commutators), Transistors, Diodes (Semiconductors), Telemeter systems, Accelerations, Coding, Electronic switches, Gates (Circuits), Digital systems, Relaxation oscillators, Mechanical drawings.

A 16-channel all-semiconductor commutator was designed and field tested in the T361, T368, XM112, and TOW missile-telemetry systems. Of approximately 200 electronic units tested, all performed satisfactorily under accelerations up

to 14,000 g and 180 rps. The design concept is based on a code-operated multiposition switch that is controlled by pulse and digital circuitry. For any switch configuration, only one input signal reaches the output terminal because of the AND gates. The binaries, therfore, change states and commutate from one channel to another with the generation of each input pulse. Theoretical details of the design and operation of the commutator are described and illustrated. (Author)

AD-437 877 Div. 8
OTS price $11.00

Radio Corp., of America, Camden, N. J.
INTRODUCTION TO THE DESIGN AND APPLICATION OF MICROMODULES.
Sept 63, 144p.
Contract DA36 039sc75968
Unclassified report

Descriptors: (*Modules (Electronic), Microminiaturization (Electronics)), (*Microminiaturization (Electronics), Modules (Electronic)), (*Handbooks, Modules (Electronic)), Design, Circuits, Specifications, Production, Small tools, Tests, Electronic equipment, Resistors, Capacitors, Coils, Crystals, Transistors, Diodes (Semiconductor).

The design guide comprises the following: Micromodule Concept, A general description of the micromodule configuration and its attendant advantages; Micromodule Design Principles; Specifications and design geometry of available microelements, design and layout procedures for micromodules, and list of demonstrated micromodule circuits; Construction of Experimental Micromodules, Tools and techniques for the construction of breadboard circuits and experimental and production micromodules; Procurement Specifications, Procurement procedures and applicable MIL specifications for microelements and micromodules; Design of Micromodular Equipment, Considerations and procedures in micromodular equipment design; Tools and Procedures for Assembly, Testing and servicing of micromodular equipment; and Micromodule Applications, Micromodular design techniques applied to military electronic equipment.

9. FLUID MECHANICS

AD-435 101 Div. 9
OTS price $2.60

Israel Inst. of Tech., Haifa.
THEORY FOR SUPERSONIC TWO-DIMENSIONAL LAMINAR BASE TYPE FLOWS USING THE CROCCO-LEES MIXING CONCEPTS,
by Josef Rom (Rabinowicz). May 62, 29p.
Rept. nos. TAE R20, TN1
Contract AF61 052 576
ARL 62 454 Unclassified report

Descriptors: (*Base flow, Supersonic flow), Two dimensional flow, Laminar flow, Laminar boundary layer, Boundary layer transition, Turbulence, Viscosity, Wake, Pressure, Theory, Compressible flow, Mathematical analysis.

A separated flow field, in which its incoming boundary layer is undistrubed up to the separation point, is defined as a base type flow. Examples of such flows are: the flows over a blunt base and over a backward facing step. The Corcco-Lees theory is applied to the supersonic, two-dimensional laminar base type flows defined above. The separated flow is divided into a mixing region and a recompression (or reattachement) region. Calculations of base pressure show its dependence on the Mach number and on two Reynolds number dependent variables. It is shown that existing base pressure data can be explained by these results. (Author)

AD-435 111 Div. 9
OTS price $17.00

Douglas Aircraft Co., Inc., Long Beach, Calif.
WIND-TUNNEL INVESTIGATION OF TURBULENT BOUNDARY LAYERS ON AXIALLY SYMMETRIC BODIES AT SUPERSONIC SPEEDS,
by Darwin W. Clutter and Kalle Kaups. 6 Feb 64, 270p. Rept. no. LB 31425
Contract NOw61 0404T, Task 61 5
Unclassified report

Descriptors: (*Turbulent boundary layer, Mathematical prediction), Wind tunnel models, Pressure, Theory, Heat transfer, Supersonic characteristics, Friction, Compressible flow, Bodies of revolution, Instrumentation, Experimental data, Tables, Photographs, Thickness.

Characteristics of supersonic turbulent boundary layers were determined for regions of large pressure gradients - both favorable and adverse - and with and without heat transfer. Details of the velocity, temperature, and static-pressure profiles were measured at several stations on three bodies of revolution at Mach numbers from 1.61 to 4.50. Profile data are presented in both graphical and tabular forms. Integrated boundary-layer thicknesses - displacement, momentum, and energy - are presented. The measured growth of the boundary-layer thicknesses is compared with that predicted by two approximate theories. (Author)

AD-435 144 Div. 9
OTS price $4.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
EXPERIMENTAL LIFT AND DRAG OF A SERIES OF GLIDE CONFIGURATIONS AT MACH NUMBERS 12.4 AND 17.5,
by R. Geiger. Mar 61, 48p. Rept. no. R61SD017
Contract AF04 647 269
Unclassified report

Descriptors: (*Boost-glide vehicles, Lift), (*Aerodynamic configurations, Hypersonic characteristics), Blunt bodies, Conical bodies, Delta wings, Drag, Angle of attack, Photographs, Experimental data, Pitch (Motion), Wind tunnel models.

A series of semi-ballistic type bodies consisting of three half sphere-cones of .3 bluntness ratio with half cone angles of 8.6, 13 and 18 degrees was tested in the shock tunnel at M = 17.5 and 12.4. In addition a representative winged glide configuration consisting of a sharp edged, 60 degree swept delta wing with cone-segment 'body' was tested with and without 'body' at M = 12.4. The angle of attack range for the half sphere-cone tests was ± 65 degrees; for the delta wing it was ± 20 degrees. (Author)

AD-435 470 Div. 9
OTS price $19.75

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
EXPANSIVE FLOW TABLES PERTINENT TO JET FLOW

CALCULATIONS,
by S. C. Lyons. Apr 64, 313p.
Contract AF40 600 1000
AEDC TDR64 73 Unclassified report

Descriptors: (*Jets, Tables), (*Exhaust gases, Configuration), Jet mixing flow, Specific heat, Rocket motor nozzles, Pressure, Gas flow, High altitude, Data, Nozzle gas flow.

Charts and tables are presented for determining approximate values of the initial turning angles and the boundary shapes of jets exhausting to low ambient temperatures. The tables have been compiled to facilitate calculations pertaining to jet flow for various ratios of specific heats from 1.10 to 1.667 and Mach numbers from 1.0000 to 100.00. The ratios p/p sub t and A/A* at the nozzle throat and the Prandtl-Meyer angle are given for each Mach number and ratio of specific heats. (Author)

AD-435 488 Div. 9
OTS price $18.00

Army Missile Command Redstone Arsenal, Huntsville, Ala.
REAL GAS FLOW FIELD PROPERTIES AROUND BLUNT CONES. VOLUME II,
by B. Z. Jenkins. 31 Dec 63, 285p.
AMC RA RF TR63 18
Unclassified report

Descriptors: (*Gas flow, Blunt bodies), (*Conical bodies, Blunt bodies), (*Blunt bodies, Conical bodies), Tables, Fluid flow, Geometric forms, Aerodynamic heating, Fluid mechanics, Spheres, Fluid mechanical properties, Shock waves, Enthalpy, Angle of attack, Configuration.

This report contains data on an equilibrium real-gas flow field passing over spherically-blunted cones at zero and five degrees angle of attack. The GASL 3-D characteristics program for the IBM 7090 computer was used to generate the data. Volume I outlines the configuration and free stream conditions (Table I) chosen for study and describes the coordinate system in detail. Figure 1 is taken from Volume I and summarizes the coordinate system used. The non-dimensionalization used is given in the symbol table. (Author)

AD-435 639 Div. 9
OTS price $10.50

Foreign Tech. Div., Air Force Systems Command, Wright Patterson Air Force Base, Ohio.
THE HEATING ON BODIES IN MOTION AT HIGH SUPERSONIC SPEEDS,
by G. I. Sakharov, V. V. Andreyevskiy and V. Z. Bukreyev. 20 Dec 63, 137p.
FTD TT63 816 Unclassified report

Trans. from Nagrev tel pri dvizhenii s bol'shimi sverkhzvukovymi skorostyami, pp. 3-106, 1961.

Descriptors: (*Aerodynamic heating, Supersonic flow), Supersonic flight, Heat transfer, Surface temperatures, Cooling, Tables, Textbooks, Countermeasures.

Problems relating to aerodynamic heating of the surface of a flying craft are investigated. A method is presented for the calculation of heat flows from without to the surface of the flying craft and of the flows of heat scattering from this surface into space. The method of calculating the equilibrium temperature of the surface is examined, as well as the method of calculating the temperature of the heat-absorbing skin. The influence of high temperatures on aviation designs is examined, and a brief review is given of the basic methods employed to control aerodynamic heating. The book is intended for senior aeronautical students attending courses at higher aviation training institutions, and may also be used by aeronautical design engineers. (Author)

AD-435 694 Div. 9
OTS price $3.60

Aberdeen Proving Ground, Md.
THE FREE FLIGHT STABILITY OF A LIQUID-FILLED SPINNING SHELL, PART 2A. SPINNING, INCOMPRESSIBLE, INVISCID LIQUID, COMPLETELY FILLED, RIGHT CYLINDRICAL CAVITY,
by W. E. Scott. Dec 63, 36p.
Proj. 1M010501A005
BRL 1233 Unclassified report

Descriptors: (*Oscillation, Yaw), (*Spin, Mathematical analysis), (*Liquids, Sloshing), Differential equations, Structural shells, Fluid mechanics, Cylindrical bodies, Momentum, Integrals, Stabilization, Aerodynamic characteristics, Interior ballistics, Damping.

The differential equation of yawing motion for a spinning shell in free flight, containing a cylindrical cavity completely filled with a liquid, spinning uniformly at the same constant rate as the shell, is derived by use of the Euler-momentum equation. An approximate solution is obtained, and it is shown that the liquid can destabilize the yawing motion. This destabilizing effect is a function of an integral of yawing velocity, and has no counterpart in aerodynamic or ballistic theory since it is due to oscillations within the liquid. This destabilization is greatest if one of the modes of oscillation of the liquid has a frequency near one of the frequencies of the yawing motion. (Author)

AD-435 740 Div. 9
OTS price $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
HYPERSONIC CYLINDER WAKE STUDIES AT MACH 20,
by A. C. Brown, R. L. Kramer and C. E. Smith.
Sep 63, 44p. Rept. no. 2 60 63 1
Unclassified report

Descriptors: (*Wake, Cylindrical bodies), Hypersonic characteristics, Model tests, Shock waves, Pressure, Distribution, Instrumentation, Reentry vehicles, Wind tunnel models, Atmosphere entry, Simulation.

The fluid mechanical behavior of wakes behind simple bodies is described. Experimental measurements in both the viscous and the inviscid flowfields of a two-dimensional circular-cylinder model were made in the LMSC hot-shot tunnel. The free-stream Reynolds number, based on model diameter, was varied between 1,800 and 90,000 at a nominal Mach number of 20. Profiles of pitot pressure, which extended from the axis to the bow shock wave, were measured at four locations behind the model. Schlieren photographs of the bow and wake shock waves were taken. Calculations of the inviscid flow-field over the model were made by means of a method-of-characteristics program for comparison with experimental data. An embedded shock wave was inserted numerically in the flow field to simulate the wake shock-wave system. The measured and computed profiles of pitot pressure in the inviscid regions of flow, as well as shock-wave shapes, are in good agreement. Details of the pitot-pressure distribution in the viscous wake are evident in the experimental data. (Author)

Division 9 - FLUID MECHANICS

AD-435 764 Div. 9
OTS price $6.60

Bolt Beranek and Newman Inc., Cambridge, Mass.
VORTEX-SHEDDING SOUNDS OF PROPELLERS,
by Donald Ross. 16 Mar 64, 66p. Rept. no. 1115
Contract NObs86680
Unclassified report

Descriptors: (*Vortices, Acoustic properties), (*Propeller noise, Vortices), Propellers (Marine), Wake, Intensity, Vibration, Hydrodynamics, Submarine noise, Equations, Bibliography, Marine engineering, Mechanical engineering, Cylindrical bodies.

Equations developed in 1956 by Phillips and by Etkin, Korbacher and Keefe for the sound intensity associated with vortex shedding are simplified through the use of hydrodynamical relationships between the Strouhal number, the oscillating lift, and the drag coefficient. It is shown that, besides the Mach number, the only factor influencing the efficiency of conversion of hydromechanical power into acoustical power is the spanwise coherency of the vortex shedding. For a rigid body, this coherent length is only about three times the transverse vortex spacing, but when a body vibrates, it will tend to be almost as long as the body itself. This effect plays a dominant role in the phenomenon of propeller singing. This report includes a literature-review of about 110 articles on various aspects of vortex shedding as well as a bibliography of some 130 items. (Author)

AD-435 813 Div. 9
OTS price $1.75

North American Aviation, Inc., Columbus, Ohio.
INVESTIGATION OF SIMULATION OF SHOCK-SHOCK INTERACTION IN HYPERSONIC GASDYNAMIC TEST FACILITY,
by Gene J. Bingham and Theodore E. Davidson.
Mar 64, 63p.
Contract AF33 657 10786, Proj. 1350, Task 135001
FDL TDR64 9 Unclassified report

Descriptors: (*Shock waves, Interference), Hypersonic wind tunnel, Test methods, Test facilities, Feasibility studies, Conical bodies, Hypersonic characteristics, Shock tubes, Models (Simulation), Hypersonic flow, Flow visualization, Schlieren photography, Pressure, Wind tunnel models, Model tests.

An experimental investigation is conducted to determine the feasibility of laboratory simulation of the interaction of the shock wave of a hypersonic body with a separate moving shock wave. The experimental technique uses a blunted cone mounted in a hypersonic wind tunnel to generate the body shock wave. Shock tubes are used to generate the moving shock wave. The hypersonic tunnel is operated at Mach 7.3. The shock tube generates moving shock wave velocities from 3600 to 13,500 feet per second. The tubes are installed at angles of 30, 60, 90, and 120 degrees with respect to the tunnel centerline. Pressure measurements and Schlieren photographs are used to define the characteristics and the shock interaction. The Schlieren photographs show that the moving shock wave will move across the hypersonic stream and intersect the body. Transient pressures associated with arrival of the moving shock wave increase with increasing shock velocity. It is concluded that the technique investigated provides a feasible method for laboratory simulation of the interactions between a moving shock wave and a hypersonic body. (Author)

AD-435 860 Div. 9
OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
EXPERIMENTAL DETERMINATION OF AERODYNAMIC DRAG ON A BLUNTED 10-DEG CONE AT ANGLES OF ATTACK IN HYPERSONIC, RAREFIED FLOW,
by David E. Boylan and William H. Sims. Apr 64, 36p.
Contract AF40 600 1000, ARO Proj. VL2407, Task 895306
AEDC TDR64 60 Unclassified report

Descriptors: (*Blunt bodies, Aerodynamic characteristics), Drag, Conical bodies, Hypersonic flow, Angles of attack, Space capsules, Model tests, Wind tunnel models, Nitrogen, Argon, Pressure, Nose cones, Impact shock, Superaerodynamics.

Aerodynamic drag on spherically capped cones of 10-deg half-angle, with and without conical afterbodies, has been measured in hypersonic, low-density flow of nitrogen and argon. Reynolds numbers varied from 375 to 3200, based on model characteristic length and free-stream conditions. Mach numbers were from 7.5 to 12.3. Angle of attack ranged from 0 to 40 deg and from 140 to 170 deg. Essential aerodynamic conditions of early entry into the atmospheres of Earth or Mars were simulated. Results have been compared with modified Newtonian and free-molecule calculations. Effects of hypersonic rarefied flow are apparent, drag coefficients being as much as double the Newtonian value in spite of the very bluff shapes. A useful correlation procedure for a large class of similar bodies is suggested. (Author)

AD-435 879 Div. 9, 25, 4, 10
OTS price $8.10

Virginia Univ., Charlottesville.
PROJECT SQUID.
Semi-annual progress rept., 1 Oct 63-31 Mar 64.
1 Apr 64, 81p.
Contract Nonr362300, Proj. NR098 038
Unclassified report

Descriptors: (*Jet propulsion, Scientific research), (*Scentific research, Research program administration), Combustion, Detonation waves, Shock waves, Fluid flow, Non-equilibrium flow, Turbulence, Transport properties, Gas flow, Gas ionization, Reaction kinetics, Thermodynamics, Magnetohydrodynamics, Statistical mechanics, Plasma medium, Reports, Indexes.

AD-435 884 Div. 9
OTS price $3.60

Space Sciences Lab., Generl Electric Co., Philadelphia, Pa.
ON THE STABILITY OF A LAMINAR BOUNDARY LAYER FOR A MAXWELLIAN FLUID,
by K. S. Wen. Dec 63, 32p. Rept. no. R63SD102
Unclassified report

Descriptors: (*Laminar boundary layer, Stabilization), Fluid flow, Relaxation time, Turbulence, Viscosity, Drag, Reduction, Perturbrtion theory, Motion, Equations, Mathematical models, Polymers, Stability.

It has been discovered that certain non-Newtonian fluid stabilizes the laminar boundary layer significantly. The present investigation is a preliminary effort toward the understanding of

the mechanism behind this unusual phenomenon. The fluid model chosen is that of a Maxwellian fluid the mechanical property of which is characterized by a relaxation time. The stability of a laminar boundary layer is then considered. It is found qualitatively that the minimum critical Reynolds number is smaller than that in the Newtonian case and decreases with increasing relaxation time. Therefore, the boundary layer will become more unstable compared with the Newtonian case. However, the results of this investigation point toward another fluid model which possess a highly stabilizing characteristic. (Author)

AD-435 901 Div. 9, 30
OTS price $3.60

Cornell U., Ithaca, N. Y.
ANALOG STUDIES OF UPSTREAM-INCLINED WAVES IN MAGNETO-GASDYNAMIC FLOW,
by Lawrence S. Iwan. Dec 63, 39p. Rept. no. NP13 566
Grant AF AFOSR62 201
Unclassified report

Descriptors: (*Magnetohydrodynamics, Two-dimensional flow). Analog systems, Magnetic fields, Hydrodynamics, Sheets, Rubber, Elasticity, Flexible structures, Wave transmission, Water, Models (Simulation), Water tanks, Model tests, Differential equations, Perturbation theory, Gas flow, Towed bodies.

An analog was devised to study two dimensional magneto-gasdynamic flow for the case of aligned magnetic and velocity fields and a perfectly-conducting compressible fluid. The analog consists of stretched elastic sheets in an incompressible fluid. The elastic sheets are analogous to a magnetic field and produce a body force on the fluid when displaced from their equilibrium positions. The differential equations describing the system are the same as the magneto-gasdynamic equations for the case cited, except for the expression for the body force in the momentum equations. Analysis of the analog system reveals striking similarties between the small disturbance propagation characteristics of that system and magneto-gasdynamics. In particular, it is shown that it is possible to simulate the conditions under which forward-inclined disturbance waves are predicted in magneto-gasdynamics flows about bodies. (Author)

AD-435 988 Div. 9
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
BOUNDARY CONDITIONS ON IONIZED GAS-SOLID CONTACT SURFACE,
by G. A. Lyubimov. 23 Mar 64, 13p.
FTD TT64 128 Unclassified report

Trans. from Prikladnoy Mekhaniki I Tekhnicheskoy Fiziki, No. 4, pp. 78-82, 1963.

Descriptors: (*Magnetohydrodynamics, Boundary layer), Gas ionization, Electrodes, Surfaces, Electrons, Plasma physics, Solids, Gas flow.

AD-435 996 Div. 9
OTS price $5.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
JOURNAL OF APPLIED MECHANICS AND TECHNICAL PHYSICS.
21 Jan 64, 57p.
FTD TT63 839 Unclassified report

Trans. from Zhurnal Prikladnoy Mekhaniki i Tekhnicheskoy Fiziki, No. 2, pp. 3-20, 154-158, 169-172, 1963.

Descriptors: (*Fluid flow, Shock waves), Statistical mechanics, Hydrodynamics, USSR, Motion, Energy, Thermodynamics, Vortices, Drops, Chemical reactions, Thermodynamics, Flames.

AD-436 087 Div. 9
OTS price $5.60

California Inst. of Tech., Pasadena.
WATER TUNNEL OBSERVATIONS ON THE FLOW PAST A PLANO-CONVEX HYDROFOIL,
by R. B. Wade. Feb 64, 53p. Rept. no. E79 6
Contract Nonr22024
Unclassified report

Descriptors: (*Hydrofoils, Convex bodies), Cavitation, Lift, Drag, Moments, Oscillation, Frequency, Water, Hydrofoil boats, Pumps, Propellers (Marine), Pressure, Angle of attack, Surfaces, Experimental data.

Experimental results of the performance of a plano-convex hydrofoil under non-cavitating and cavitating conditions are presented. Lift, drag and moment coefficients are given as a function of the cavitation number, together with the behavior of the cavity length. Some unsteady effects occurring under cavitating conditions are also considered. In this region of cavitation the magnitude of the force oscillations together with the fluctuation of the cavity length are presented. The frequency of these oscillations and the general behavior of the cavity are discussed. (Author)

AD-436 094 Div. 9
OTS price $9.10

Ordnance Research Lab., University Park, Pa.
MEASURED AND THEORETICAL VELOCITY COMPONENTS OF AN 8:1 ELLIPSOID AT AN ANGLE OF ATTACK OF SIX DEGREES,
by E. J. Rodgers. 31 Mar 64, 104p.
Contract NOw63 0209c5
Unclassified report

Descriptors: (*Angle of attack, Measurement), Fluid dynamic properties, Fluid flow, Probes (Electromagnetic), Wind tunnel models, Velocity, Static pressure, Calibration, Tests, Curve fitting, Downwash, Sideslip, Programming (Computers), Bodies of revolution.

Plots are presented of the experimentally obtained velocity components and those predicted by potential theory for an ellipsoid of revolution with an 8:1 slenderness ratio at an angle of attack of six degrees. This documentation is intended to be a valuable set of experimental data for use by those investigating fluid-mechanic problems different from those investigated by the author in a previous study. (Author)

AD-436 288 Div. 9
OTS price $3.60

Stanford Univ. Calif., Div. of Engineering Mechanics.
AXISYMMETRICAL CREEP BUCKLING OF CLAMPED

SHALLOW SPHERICAL SHELLS,
by N. C. Huang. Dec 63, 32p. Rept. no. 2; TR145
Contract Nonr225 69
Unclassified report

Descriptors: (*Spheres, Buckling (Mechanics)), Viscoelasticity, Deflection, Time, Equations, Pressure, Deformation, Integral equations, Strain (Mechanics), Stresses, Numerical analysis, Creep.

In this paper consider the effect of viscoelastic properties of shells on the axisymmetrical buckling is considered. For viscoelastic shells under constant uniform pressure, the average vertical deflection increases with time. When time reaches a critical value t sub cr, the rate of increase of the average vertical deflection becomes very high, which indicates the initiation of snapping of the shell at this instant. After snapping, the shell continues to deform. The object is to find the critical time t sub cr for different pressures and for shells with different geometrical parameters. The pressure on shells is considered to be applied either by pressurized air in a chamber of large volume or by an incompressible fluid. For the latter loading condition, the average deflection remains constant and the applied pressure relaxes. In this paper, the relaxation of external pressure of this type is analyzed, as well as prescribed pressure increases. (Author)

AD-436 334 Div. 9, 31
OTS price $1.60

David Taylor Model Basin, Washington, D. C.
INDUCED VELOCITY FIELD OF A FULLY CAVITATING PROPELLER AND INTERACTION EXPERIMENTS WITH A FULLY CAVITATING PROPELLER BEHIND A HYDROFOIL,
by John L. Beveridge. Apr 64, 13p.
Proj. SR009 01 01
DTMB 1832 Unclassified report

Descriptors: (*Propellers (Marine), Cavitation), (*Hydrodynamics, Propellers (Marine)), (*Hydrofoils, Hydrodynamics), Velocity, Fluid flow, Thrust, Theory, Models (Simulations), Programming (Computers), Model tests, Hydrodynamic configurations.

The induced velocity field of a 3-bladed fully cavitating propeller was calculated by considering the combined effects of propeller blade loading and blade cavity thickness. Numerical results for the case investigated showed that forward of such a propeller the total induced axial velocity is quite small, and opposes the ambient axial velocity. This result is consistent with the experimental results presented where the thrust deduction of a fully cavitating propeller behind a hydrofoil was found to be practically zero. (Author)

AD-436 451 Div. 9, 25, 30
OTS price $8.10

University of Southern Calif., Los Angeles, Engineering Center.
RESEARCH ON RAREFIED GASDYNAMICS AND PLASMADYNAMICS.
Summary rept. for Sep 62-Aug 63,
by Raymond L. Chuan. Dec 63, 82p. Rept. 93 101
Grant AF AFOSR55 63
AFOSR 64 0565 Unclassified report

Descriptors: (*Superaerodynamics, Hypersonic flow), (*Plasma physics, Hypersonic flow), Plasma medium, Hypersonic characteristics, Wake, Density, Two-dimensional wakes, Flat plate models, Shear stresses, Pressure, Heat transfer, Spheres, Test facilities, Impact shock, Nitrogen, Magnetohydrodynamics, Pressure gages, Pitot tubes, Hypersonic wind tunnels.

Contents: Hypersonic Low Density Wakes; Free-Molecule Theory for Two-Dimensional Wakes, and Experiments in Low Density Wakes; Impact Pressure at Low Density (Theoretical trestment, and Experiments); Magnetohydrodynamic waves in a flowing plasma; and Free Molecule Electrostatic Probe.

AD-436 511 Div. 9
OTS price $6.60

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
LINEARIZED THEORY FOR UNSTEADY TRANSONIC FLOW,
by Marten T. Landahl. Mar 63, 52p. Rept. no. 63 2
Grant AFOSR156 63
AFOSR 4963 Unclassified report

Presented at the Symposium Transsonicum, 3-7 Sep 1962, Aachen, Germany.

Descriptors: (*Transonic flow, Stability), Oscillation, Flutter, Theory, Power series, Mathematical analysis, Wings, Delta wings, Damping, Swept wings, Airfoils, Perturbation theory, Rectangular bodies.

AD-436 542 Div. 9, 15
OTS price $8.60

The RAND Corporation, Santa Monica, Calif.
AN ANALYSIS OF THE PARTICLE-IN-CELL NUMERICAL PROCESS IN ONE-DIMENSIONAL PROBLEMS,
by R. A. Papetti. Apr 64, 92p. Memo no. RM3613PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Boundary value problems, Analysis), (*Numerical analysis, One-dimensional flow), Mathematical models, Errors, Energy, Equations, Differential equation, Inequalities.

AD-436 567 Div. 9
OTS price $2.60

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
DETERMINISTIC PREDICTIONS OF THE MOTIONS OF A HYDROFOIL CRAFT IN IRREGULAR SEAS,
by R. P. Bernicker. Jan 64, 29p. Rept. no. 1003
Contract NObs88186, Proj. SS600 000, DL 2695 225, Task 1703
Unclassified report

Descriptors: (*Hydrofoil boats, Motion), Ocean waves, Mathematical prediction, Integral transforms, Fourier analysis, Hydrofoils, Stability, Pitch (Motion), Experimental data.

The heave and pitch response time-histories of a fully wetted surface-piercing dihedral hydrofoil craft in irregular head seas was calculated from theoretical considerations, using the concept of the impulse response function. This function, which is the Fourier transform of the transfer function, was used in a convolution-type integral with the actual measured wave time-history to give a point-by-point deterministic prediction of the longitudinal motions. Comparison with experimental records indicates that the method yields a satisfactory approximation to the actual motion to a degree similar to that previously attained with surface ships and fully submerged bodies, and that it further substantiates the linearity of a hydrofoil craft-wave system. (Author)

AD-436 584 Div. 9
OTS price $4.60

Institute of Engineering Research, Univ. of Calif., Berkeley.
THE INCOMPRESSIBLE LAMINAR AXISYMMETRIC WAKE BEHIND A VERY SLENDER CYLINDER IN AXIAL FLOW,
by Henri Viviand and Stanley A. Berger.
3 Feb 64, 46p. Rept. no. AS64 5
Contract Nonr222 45
Unclassified report

Descriptors: (*Wake, Slender bodies), (*Slender bodies, Wake), Axially symmetric flow, Cylindrical bodies, Laminar flow, Incompressible flow, Mathematical analysis, Series, Laminar boundary layer, Base flow, Velocity.

An attempt is made to solve the near wake problem behind a very slender cylinder in axisymmetric incompressible laminar flow by a series expansion method. Although the solution thus found applies only up to a very limited distance downstream of the base, it exhibits important differences with the corresponding two-dimensional problem of the wake behind a flat plate, which are characteristic of the axisymmetry of the flow. This series expansion and an asymptotic expansion for the far wake region are compared with a simple solution obtained by linearizing the momentum equation. (Author)

AD-436 602 Div. 9
OTS price $13.50

Pennsylvania State Univ., University Park.
CAVITATION HYSTERESIS,
by Allen L. Treaster. June 64, 200p.
Unclassified report

Master's thesis.

Descriptors: (*Cavitation, Hysteresis), Hemispherical shells, Surface properties, Solids, Theory, Models (Simulation), Bubbles, Particles, Test equipment, Tests, Hydrodynamics, Pressure, Test methods, Water, Models (Simulation), Velocity, Diffusion, Surface tension, Equations, Centrifugal pumps, Bears, Fluid flow, Ogives, Orifices, Water tunnels, Nose cones, Air Temperature.

AD-436 700 Div. 9, 25
OTS price $3.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE DIRECT MEASUREMENT OF STATIC TEMPERATURES IN SHOCK TUNNEL FLOWS,
by E. P. Muntz and Shirley J. Abel. Apr 64, 40p. Rept. no. R64SD25
Contract AF04 694 222
Unclassified report

Descriptors: (*Shock tubes, Hypersonic flow), (*Temperature, Measurement), Fluid flow, Electroluminescence, Excitation, Nitrogen, Electron beams, Calibration, Photomultipliers, Lenses, Optical filters, Hyperfine structure, Design, Tables.

A technique for measuring static temperatures in shock tunnel flows is described. It is based on the electronic excitation of nitrogen molecules by a beam of high energy electrons. The resulting spontaneous emission or electroluminescence has a spectral intensity distribution that can be related to the gas static temperature. A method has been devised to measure this intensity distribution during the short test time available in a shock tunnel. From such a measurement the gas temperature can be deduced by the methods outlined in the text. The technique has been used to make a number of temperature measurements in a shock tunnel. Some of these are reported for illustrative purposes. (Author)

AD-436 713 Div. 9, 15
OTS price $1.60

David Taylor Model Basin, Washington, D. C.
NUMERICAL EVALUATION OF INTEGRALS CONTAINING MODIFIED BESSEL FUNCTIONS,
by W. L. Haberman and E. E. Harley. Mar 64, 15p.
DTMB 1580 Unclassified report

Descriptors: (*Integrals, Tables), (*Cylindrical bodies, Integrals), Bessel functions, Boundary value problems, Spheres, Rotation, Heat transfer, Couette flow, Viscosity.

Various infinite integrals containing modified Bessel functions were evaluated numerically on a high-speed computer. The results are presented in tabular form. (Author)

AD-436 729 Div. 9, 30
OTS price $10.50

Rensselaer Polytechnic Inst., Troy, N. Y.
RESEARCH IN HYPERSONICS AND MAGNETOHYDRODYNAMICS,
by Z. S. Chang, R. E. Duffy, R. F. Hoppman, D. F. Rogers and T. R. Sundaram, Jan 64, 138p.
Contract AF33 616 7312, Proj. 7064
ARL 64 5 Unclassified report

Descriptors: (*Hypersonic flow, Air force research), (*Hypersonic wind tunnels, Shock tubes), (*Magnetohydrodynamics, Instrumentation), Design, Hypersonic characteristics, Flow visualization, Calibration, Superaerodynamics, Plasma physics, Hypersonic nozzles, Nonequilibrium flow, Two-dimensional flow, Electrical conductance, Pressure gages.

The research programs in hypersonics at the Rensselaer Polytechnic Institute are discussed. The hypersonic shock tunnel and the calibration shock tube are described. Programs in nonequilibrium fluid dynamics, rarefied gasdynamics, and plasma physics are described. Theoretical studies are devoted to nonequilibrium inviscid flow. (Author)

AD-436 754 Div. 9, 30
OTS price $3.60

Southampton Univ. (England).
RESEARCH IN HYPERSONIC AEROTHERMODYNAMICS.
Final rept., 1 Oct 62-30 Sep 63,
by J. P. Appleton, K. N. C. Bray, R. A. East, P. L. Tanner and D. J. Buckingham. Feb 64, 37p.
Rept. no. 251
Contract AF61 052 250
ARL 64 71 Unclassified report

Descriptors: (*Hypersonic flow, Separation), (*Hypersonic wind tunnels, Plasma jets), (*Shock tubes, Shock waves), Wind tunnel models, Base flow, Gas flow, Mathematical models, Laminar boundary layer, Perturbation theory, Supersonic nozzles, Magnetohydrodynamics, Plasma medium, Electrons, Temperature, Thermal conductivity, Recombination reactions, Electron density, Electron transitions, N-body problem, Conical bodies, Cylindrical bodies.

Topics which are covered in this report are: (1) a study of separated hypersonic flows produced by cavities in cone-cylinder models; (2) measurements in a small, low density plasma jet wind tunnel; (3) running time and shock wave attenuation studies in a shock tube; (4) a derivation of an energy balance equation for determining the electron temperature in a non-equilibrium plasma; and (5) a calculation of the rate of three-body electron-ion recombination, using a simple classical model. (Author)

AD-436 778 Div. 9
OTS price $8.10

Illinois Inst. of Tech., Chicago.
A STUDY OF OSCILLATORY WING PROPULSION.
Final rept.,
by I. Michelson. Nov 63, 83p.
Contract Nonr140608
Unclassified report

Descriptors: (*Wings, Oscillation), (*Wings, Propulsion), Force (Mechanics), Aerodynamic characteristics, Wake, Wind tunnel models, Model tests, Thrust, Momentum, Vorticity, Gas flow, Flate plate models, Energy, Boundary layer, Airframes, Structures, Test equipment, Hydrodynamics, Motion.

The propulsive force on an oscillating wing in uniform flow has been investigated. A survey was made of the principal hydro- and aerodynamic considerations which are necessary for an adequate physical understanding of this phenomenon. An extension of one portion of this analysis has led to a new relationship of fundamental interest, relating propulsive thrust to flapping frequency, amplitude, and flow speed. Wind tunnel measurements of instantaneous, small, oscillatory forces by means of a virtual center suspension and balance system are discussed. An account is given of actual measurements in a particular case, which are believed to be the first experimental verification in a wind tunnel, of oscillatory wing propulsion. (Author)

AD-436 790 Div. 9
OTS price $5.60

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
EXPERIMENTAL STUDY OF HIGH SPEED HYDROFOILS, VOLUME III,
by H. R. Wright. 26 Aug 63, 56p. Rept. no. SAR A45
Contract Nobs 88454
Unclassified report

Descriptors: (*Hydrofoils, Scientific research), Hydrodynamics, Model tests, Cavitation, Design, Lift, Drag, Angle of attack, Pitch (Motion), Moments, Theory, Pressure, Experimental data, Equations, Corrections, Flutter, Analysis, Vibration.

This test program was conducted to measure the hydrodynamic characteristics of a series of supercevitating and transcavitating hydrofoil models with various planforms and sections to provide a design procedure to predict hydrodynamic characteristics for this type hydrofoil. Twenty hydrofoil models were tested in the Grumman Whirling Tank at three depths and at a sufficient number of speeds and angles of attack to fully define their hydrodynamic characteristics. Lift, drag, pitching moment, and strut base pressure were measured for all models, and cavity pressure and foil base pressure were measured for the supercavitating models. Classic supercavitating hydrofoil theory is shown to predict test results with an accuracy adequate for design if a modified value for the cross-flow lift coefficient is accepted. (Author)

AD-436 796 Div. 9
OTS price $6.60

Foreign Tech. Div. Air Force Systems Command Wright-Patterson Air Force Base, Ohio.
ENGINEERING JOURNAL (SELECTED ARTICLES).
23 Mar 64, 61p.
FTD TT63 79 Unclassified report

Trans. from Inzhenernyy Zhurnal, 2:3, pp. 14-42, 68-73, 119-125, 161-162, 1962.

Descriptors: (*Fluid flow, Aerodynamic characteristics), USSR, Hypersonic flow, Slender bodies, Blunt bodies, Conical bodies, Delta wings, Shock waves, Separation, Laminar boundary layer, Flat plate models, Aerodynamic heating, Heat transfer, Gas flow, Injection, Cooling, Boundary layer transitions, Momentum, Turbulent boundary layer, Stagnation point, Supersonic flow, Plasma medium, Magnetohydrodynamics, Magnetic fields, Acceleration, Cylindrical bodies, Structural shells, Aeroelasticity, Theory, Mathematical analysis.

Contents: Hypersonich Flow Past Slender Blunt Elliptic Cones; Laminar Boundary Layer with Reaction Front; Development of Plane-Parallel Boundary Layer in the Neighborhood of the Critical Point of a Blunt Body, set in Motion Impulsively; On the Nature of Flow in the Stagnation region; On Plasma Acceleration by a Megnetic Field; On the Behavior of Heated Plates and Sloping Shells in a Gas Flow; The Equation of Three Velocities for a Shock Tube. (Author)

AD-436 803 Div. 9, 25
OTS price $4.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
BOW-SHOCK STRUCTURE AND SLIP EFFECTS IN LOW-DENSITY HYPERSONIC FLOW,
by H. K. Cheng and A. L. Chang. Feb 64, 45p.
Contract AF33 616 7812, Proj. 7064
ARL 64 26 Unclassified report

Descriptors: (*Blunt bodies, Hypersonic flow), Thickness, Boundary layer, Shock waves, Thermal conductivity, Viscosity, Heat transfer, Stagnation point, Transport properties, Temperature, Thickness, Axially symmetric flow.

Hypersonic plane and axisymmetric flows around simple blunt shapes are treated within the framework of the Navier-Stokes equations, assuming a high compression ratio across the shock transition zone. The disturbed flow field is treated in two thin adjoining regions: the shock layer and the shock-transition zone. The present investigations, which complement a previous development (Cheng 1963), provide an analytical solution for the structure of the bow shock and analyses of slip and temperature jump, as well as other higher-order effects. The formulation based on the two layers is shown to be consistent with the asymptotic expansion solution of the Navier-Stokes equations for high shock compression ratio and high Reynolds numbers. The present formulation provides uniformly valid approximations to the tangential velocity, temperature, streamline pattern and other properties of the whole flow field. The analysis of the structure of the bow shock takes into account the influence of the downstream flow nonuniformity on the shock profile. These results provide (for the first time) a description of the hypersonic

flow field around a body without the usual shock discontinuity. For a highly cooled hyperboloidal shape at infinite Mach number a temperature maximum occurs inside the transition zone and a sharp frontal surface is observed which separates the disturbed flow region from the upstream uniform flow. (Author)

AD-436 841 Div. 9
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CALCULATION AND EXPERIMENTAL INVESTIGATION OF AUTOOSCILLATIONS OF CYLINDRICAL SHELLS AND PANELS IN A GAS FLOW,
by R. Ye. Lamper and L. G. Shandarov. 25 Mar 64, 15p.
FTD TT63 1227 Unclassified report

Trans. from Izvestiya Akademii Nauk SSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No. 3, pp. 58-64, 1963.

Descriptors: (*Cylindrical bodies, Vibration), (*Structural shells, Vibration), Supersonic characteristics, Mathematical analysis, Oscillation, Airframes, Equations, Damping, Wind tunnel models, Stability, Panels (Structural).

AD-436 884 Div. 9, 31, 1
OTS price $18.00

Coll. of Engineering and Aeronautical Sciences, U. of Maryland, College Park.
SURVEY OF LOW-ASPECT-RATIO CHARACTERISTICS USEFUL IN THE DESIGN OF CONTROL SURFACES,
by Richard I. Windsor. Nov 62, 284p. Rept. no. ER62 1
Contract NObs84240, Proj. SF013 02 05, Task 1979
Unclassified report

Descriptors: (*Airfoils, Aspect ratio), (*Flight control surfaces, Subsonic characteristics), Swept-back wings, Aerodynamic configurations, Ships, Submarines, Wings, Wind tunnel models, Angle of attack, Maneuverability, Experimental data, Taper, Hydrofoils.

A compilation is presented of characteristics obtained from subsonic experimental data for many different plan forms of low-aspect-ratio surfaces. The purpose of this compilation is to provide information for the design of ship and submarine control surfaces. (Author)

AD-436 886 Div. 9
OTS price $6.60

Polytechnic Inst. of Brooklyn, N.Y.
ON THE COMPRESSIBLE LAMINAR BOUNDARY LAYER WITH SUCTION,
by Morris Morduchow and Stanley P. Reyle. Oct 63, 67p. Rept. no. PIBAL807
Grant AF AFOSR1 63, Proj. 9781 01
Unclassified report

Descriptors: (*Laminar boundary layer, Separation), (*Boundary layer control, Vacuum), Suction slots, Compressible flow, Enthalpy, Heat transfer, Flat plate models, Two-dimensional flow, Integral equations.

The compressible laminar boundary layer in a pressure gradient with suction, for a Prandtl number of unity and a linear viscosity-temperature relation, is analyzed on the basis of the momentum and thermal integral equations in conjunction with sixth and (for separation) seventh degree velocity, and seventh degree stagnation enthalpy profiles. For flows over a flat plate, and for flows in a pressure gradient, straightforward and simple methods of calculating the boundary layer for a given Mach number, a given uniform wall temperature, and a given suction distribution are shown. Wherever exact or purportedly accurate solutions for an impermeable or a permeable wall are available, the results obtained by the present analysis agree very well with such solutions, including the general asymptotic suction solutions for compressible flows with a pressure gradient and heat transfer. Finally, the boundary layer with a linearly diminishing external velocity is calculated. (Author)

AD-437 158 Div. 9
OTS price $9.10

David Taylor Model Basin, Washington, D. C.
SUPERCAVITATING AND VENTILATED PERFORMANCE OF THREE HYDROFOIL SECTIONS,
by G. G. Dobay and N. L. Ficken. Jan 64, 105p.
Proj. SS600 000
DTMB 1828 Unclassified report

Descriptors: (*Hydrofoils, Cavitation), (*Cavitation, Hydrofoils), Hydrodynamic configuration, Lift, Drag, Angle of attack, Ventilation, Theory, Experimental data.

Two-term, 5-term, and flat-faced hydrofoils with AR = 3, rectangular plan form, were tested to determine their supercavitating and ventilated performance. It was found that the 5-term section provides the highest lift-drag ratio for the same lift coefficient. The theoretical prediction agrees well with experimental data at high angles of attack. Means are suggested to hasten the development of leading edge cavitation at low angles of attack and to overcome the oscillating nature of the lift and drag forces in the transition region (between fully wetted and fully cavitating conditions). (Author)

AD-437 190 Div. 9
OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
PRELIMINARY RESULTS ON FAST LUMINOUS FRONTS IN ELECTROMAGNETIC SHOCK TUBES,
by R. A. Nelson. Nov 63, 14p. TR 17
Contract SD103, Proj. 3857; ARPA Order 281 62
Unclassified report

Descriptors: (*Shock tubes, Ionization), Shock waves, Fluid dynamics, Theory, Supersonic flow, Equations, Electromagnetic properties, Photon bombardment.

Preliminary results of a theoretical study of precursor effects in electromagnetic shock tubes are presented. In particular, an examination is made of the theories of fast luminous fronts which are observed to precede shock waves in such shock tubes. Errors in a theory by Paxton and Fowler are indicated. (Author)

AD-437 239 Div. 9
OTS price $5.60

Ordnance Research Lab., Pennsylvania State U., University Park.
THE FLOW AND INTERFERENCE EFFECTS OF A BODY OF REVOLUTION AND ITS STABILIZING SURFACES WHEN AT AN ANGLE OF ATTACK,
by E. J. Rodgers. 31 Mar 64, 58p.
Contract NOw63 0209c
Unclassified report

Descriptors: (*Bodies of revolution, Aerodynamic characteristics), (*Wing-body configurations, Interference), Subsonic characteristics, Aspect ratio, Fins, Aerodynamic control surfaces, Control surfaces, Vortices, Wind tunnel models, Angle of attack, Pressure, Distribution, Lift, Aerodynamic configurations, Instrumendation.

The flow over a body of revolution and its stabilizing surfaces, at an angle of attack, was studied in order to obtain a better understanding of the real flow effects as well as the interference effects between components of the configuration. The velocity field about the configuration, the surface flow, and the pressure distribution were obtained with the model mounted in the wind tunnel of the Ordnance Research Laboratory. Analysis of data showed there is an increase in lift on the body and a decrease in lift on the stabilizing surfaces from that of the isolated components at the same incidence to the flow. The interference effects between components is evidenced by the surface flows and pressure distribution calculated from the measured velocity field. The decreased lift on the stabilizing surfaces is clearly related to the flow over the aft part of the body. (Author)

AD-437 271 Div. 9, 25
OTS price $8.10

Cincinnati Univ., Ohio.
THE INTERACTION OF UNEQUAL OBLIQUE SHOCK WAVES IN A HYPERSONIC FLOW.
Interim technical rept., Aug 62-May 63,
by F. R. Tepe, Jr. and W. Tabakoff. Aug 63, 83p.
Contract AF33 616 8453, Proj. 7064
ARL 63 146 Unclassified report

Report on Aerothermodynamic Investigations in High-Speed Flow.

Descriptors: (*Hypersonic flow, Shock waves), Boundary layer, Intensity, Schlieren photography, Pressure, Temperature, Density, Viscosity, Velocity, Specific heat, Programming (Computers), Experimental data, Tables, Vortices, Theory.

The interaction of oblique shock waves of different intensities in a hypersonic flow both from the theoretical and experimental viewpoints is investigated. The primary purpose of this study is to predict the angle with respect to the free stream flow direction of the vortex layer or contact surface which is generated by this interaction phenomena. Theoretical inviscid and vis cous solutions were programmed on the IBM 7090 computer for a range of Mach numbers from 6 to 20 and a range of flow deflection angles between 2 degrees and 30 degrees. In addition, empirical relations are developed to predict this contact surface angle with a minimum of computation, if a high degree of accuracy is not required. The three methods of solution are then compared and recommendations made as to under what conditions each is applicable. In addition, the effect of the variation of the various flow and geometric parameters on the viscous solution is considered. (Author)

AD-437 272 Div. 9, 25
OTS price $2.60

Southampton Univ. (England).
RESEARCH IN HYPERSONIC AEROTHERMODYNAMICS.
Annual summary rept.
Oct 62, 30p. Rept. no. 230; TN15
Contract AF61 052 250
ARL 63 51 Unclassified report

Descriptors: (*Hypersonic flow, Aerodynamic characteristics), (*Heat transfer, Measurement), Schlieren photography, Axially symmetric flow, Temperature, Pressure, Hypersonic nozzles, Hypersonic wind tunnels, Solutions, Gases, Helium, Electric discharges, Freezing.

AD-437 283 Div. 9
OTS price $3.60

North American Aviation, Inc., Downey, Calif.
RECENT STUDIES IN BOUNDARY LAYER TRANSITION,
by E. R. van Driest. Nov 63, 36p. Rept. no. SID64 546
Contracts AF49 638 250, AF49 638 1178
AFOSR 64 0589 Unclassified report

Presented at the Founders' Meeting of the Society of Engineering Science, Purdue University, 4-6 Nov 63.

Descriptors: (*Boundary layer transitions, Supersonic flow), Reynolds number, Incompressible flow, Shear stresses, Turbulent boundary layer, Hydrodynamic configurations, Vortices, Pipes, Surface properties, Turbulence, Additives, Low-drag airfoils.

Experimental effects of controlled surface roughness and freestream turbulence on boundary layer transition are described and theoretical correlations of the data presented. Recent results on the transition of boundary layers in non-Newtonian fluids are also discussed. It is found that a small increase in fluid plasticity strongly delays transition. (Author)

AD-437 289 Div. 9, 15
OTS price $3.60

Mathematics Research Center, Univ. of Wisconsin, Madison.
ON THE PROBLEM OF WEAK MACH REFLECTION,
by Akira Sakurai. Mar 64, 39p. Rept. no. TSR460
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Shock waves, Mathematical models), Reflections, Attenuations, Fluid flow, Deflection, Aerodynamic configurations, Theory, Equations.

To find a clue to the well known problem of the discrepancy in the weak Mach reflection, fundamental assumptions on which the three shock theory by von Neumann are based, are examined and they are shown to become inadequate as the shock waves become weaker. With use of this fact, the three shock theory is modified, giving the Mach shock angles consistent with the experimental values. For further study, an approach to utilize the flow field near the triple point is suggested and proves to give the angle values agree well with the experimental data. (Author)

AD-437 305 Div. 9
OTS price $1.60

David Taylor Model Basin, Washington, D. C.
RHEOELECTRIC MEASUREMENTS OF SOME THEORETICAL EFFECTS OF GROUND PROXIMITY ON WINGS,
by Harvey R. Chaplin and Lewis W. Masters.
Jan 64, 16p.
DTMB Aero 1068 Unclassified report

Descriptors: (*Ground effect, Wings), (*Downwash, Measurement), Drag, Test methods, Electric currents, Electrical conductance, Aspect ratio, Electric fields, Theory, Load distribution.

An electric analogy to the problem of a wing in ground effect, assuming the shed vortex system to trail straight behind the wing, was established, using Teledeltos conductive paper as the working medium. For the case of uniform downwash, span-loading distributions and effective aspect ratio were measured, as functions of height/span ratio, for plane wings, certain end-plated wings, and for a wing of which the lateral cross-section is a circular arc with its center lying at the ground surface. The results indicate that the use of end plates to reduce the ground clearance is relatively ineffective. (Author)

AD-437 345 Div. 9
OTS price $8.10

Naval Ordnance Lab., White Oak, Md.
AN ESTIMATE OF THE MINIMUM REYNOLDS NUMBER FOR TRANSITION FROM LAMINAR TO TURBULENT BOUNDARY-LAYER FLOW BY MEANS OF ENERGY CONSIDERATIONS,
by Neal Tetervin. 3 Nov 60, 81p.
NOL ARR98; NAVORD 6854 Unclassified report

Descriptors: (*Boundary layer transitions, Reynolds number), Laminar boundary layer, Turbulent boundary layer, Shear stresses, Measurement, Laminar flow, Stability, Theory, Incompressible flow, Energy, Flat plate models, Mathematical analysis.

In a turbulent flow both the viscous and the Reynolds shearing stresses dissipate mean-flow mechanical energy whereas, in a laminar flow, the Reynolds shearing stresses are absent; the rate of dissipation of both types of flow varies with the Reynolds number. Because the total dissipation of mechanical energy in a turbulent flow is large enough to supply both the viscous and the Reynolds stress dissipation, it is inferred that transition cannot begin unless the Reynolds number is large enough for the rate of dissipation of the turbulent flow to exceed that of the laminar flow. This concept leads to the criterion for the calculation of the minimum Reynolds number for transition in a boundary layer, namely, that the laminar- and turbulent-friction coefficients be equal. The minimum Reynolds number based on the boundary-layer momentum thickness is estimated to be about 44 for incompressible flow over a flat plate. For an insulated plate, this number rises to 214 at a Mach number of 10. Computations of the effect of pressure gradient indicate that a favorable pressure gradient causes a small increase in the minimum Reynolds number for transition. (Author)

AD-437 571 Div. 9, 12
OTS price $11.00

Cook Research Labs., Morton Grove, Ill.
DYNAMICS OF SEPARATING BODIES. VOLUME IV. DYNAMIC EJECTIONS AT MACH NUMBERS OF 2, 4, 5 AND 8,
by R. D. Turner. Dec 63, 141p. Rept. no. ORA63 15
Contract AF29 600 2956, Proj. 7856, Task 78548
ORA 63 15 Unclassified report

Descriptors: (*Space capsules, Ejection), Launch vehicles (Aerospace), Wake, Model tests, Wind tunnel models, Separation, Test methods, Flared afterbodies, Schlieren photography, Trajectories, Penetration, Cylindrical bodies, Velocity, Hypersonic characteristics, Supersonic characteristics.

Dynemic models were ejected from the side and base of a carrier vehicle at Mach numbers of 2, 4, 5 and 8. Two capsule shapes were investigated in this program to enable determination of the effects of capsule geometry. The flared capsule confiquration was ballasted in two ways to provide two pitch moments of inertia. The cylindrical shape capsule possessed one moment of inertia. The data obtained from these ejections were in the form of high speed motion pictures. The Mach 2, 4, and 5 data were obtained through a Schlieren optical system. The Mach 8 data were obtained with a conventional high speed camera. All 55 data films were analyzed and trajectories are presented. Qualitative descriptions of the dynamic behavior and preliminary quantitative calculations were performed to compare the aerodynamic coefficients obtained from the dynamic tests with those obtained from static tests discussed in Volumes II and III. (Author)

AD-437 582 Div. 9
OTS price $3.60

Aerospace Corp., Los Angeles, Calif.
LINEARIZED VORTEX FLOWS,
by W. S. Lewellen. 24 Apr 64, 36p. Rept. no. ATN 64 9227 4
Unclassified report

Descriptors: (*Fluid flow, Linear systems), (*Vortices, Fluid flow), Momentum, Convection, Equations, Compressible flow, Perturbation theory, Rotation, Compressive properties, Stagnation point, Analysis, Motion, Reynolds number, Shear stresses.

Steady vortex flows driven by a radial convection of angular momentum are considered. The incompressible Navier-Stokes equations are linearized by considering pertubations about both simple, nonrotating flows and strongly rotating flows; i.e., the equations are expanded for large and small Rossby numbers. Axial variations in a swirl superimposed upon a stagnation-point flow (with radial inflow) are considered for large Rossby numbers. An analytic solution is found for the axial decay of a given swirl. By considering flows for small Rossyby numbers, it is found that in flows dominated by rotation, the fluid motion is forced to be twodimensional except in thin shear regions where necessary adjustments imposed by boundary conditions are made. The properties of these different shear layers are dependent on the gradient of the basic circulation of the flow as well as the Reynolds number. (Author)

AD-437 657 Div. 9
OTS price $3.60

Training Center for Experimental Aerodynamics, Rhode-Saint-Genese (Belgium).
POWERED LIFT MODEL TESTING FOR GROUND PROXIMITY EFFECTS,
by P. E. Colin. Oct 63, 32p.
Contract DA91 591EUC2771
TCEA TN14 Unclassified report

Descriptors: (*Vertical take-off planes, Ground effect), (*Ground effect, Lift), Ground effect machines, Interference, Jets, Model tests, Experimental data.

The effect of ground proximity on the performance of powered lift vehicles was investigated on simple models using two different testing methods. Single and double-jet models representing VTOL configurations and an air-cushion model with peripheral jet were tested both in the wind-tunnel where a stationary plate immersed in the flow was used to represent the ground and on a special rig allowing the models to be moved over a fixed ground plate. The lift and centre-of-pressure locations were determined with both

techniques for various model heights above the ground-plate over a range of momentum coefficients. The results obtained with both methods are compared. (Author)

AD-437 679 Div. 9
OTS price $15.50

Princeton Univ., N. J.
HYDROFOIL INSTABILITY AT LOW MASS DENSITY RATIOS, by R. L. Caporali and E. J. Brunelle. Mar 64, 236p. Rept. no. AMSR670
Contract Nonr185840
Unclassified report

Descriptors: (*Hydrofoils, Flutter), (*Flutter, Hydrofoils), Two-dimensional flow, Marine engineering, Cantilever beams, Mathematical models, Stability, Structural parts, Swept wings, Density.

A study is made of the low mass-density ratio hydroelastic behavior of fully wetted lifting surfaces of sufficiently high aspect ratio to justify the fundamental assumptions of two-dimensional, unsteady hydrodynamic fluid forces and the concept of a rigid streamwise section. Hence, this study is particularly applicable to lifting surfaces in marine usage. In particular, the strut supports of hydrofoil boats which operate at sub-cavitating speeds may be regarded as typical of the hydroelastic systems toward which this investigation is directed. Part I concerns the low mass-density ratio flutter behavior of the two-degree-of-freedom 'typical section' and shows that there exists a critical mass-density ratio below which the classic 'typical section' analysis will predict no dynamic stabilities. However, some extremely sensitive cause and effect relationships are noted. Part II deals with the low mass-density ratio hydroelastic behavior of fully wetted, uniform, cantilever struts or other lifting surfaces, both with and without an angle of sweepback. It was ascertained that the low mass-density ratio flutter behavior of such structures can be properly predicted only if the spanwise character of the strut is explicitly included in the mathematical model used in the analysis. It is shown that a positive non-zero sweep angle is essential for low mass-density ratio bending-torsion flutter of uniform cantilevered struts to occur. (Author)

AD-437 687 Div. 9
OTS price $8.10

Firestone Flight Sciences Lab., California Inst. of Tech., Pasadena.
SUPERSONIC SEPARATED AND REATTACHING LAMINAR FLOWS: I. GENERAL THEORY AND APPLICATION TO ADIABATIC BOUNDARY LAYER-SHOCK WAVE INTERACTIONS, by Lester Lees and Barry L. Reeves. 4 Oct 63, 81p. TR 3
Grant AF AFOSR54 63
Unclassified report

Report on Separated Flows Research Project.

Descriptors: (*Laminar boundary layer, Separation), (*Boundary layer transitions, Separation), Shock waves, Supersonic flow, Theory, Adiabatic gas flow, Flat plate models, Differential equations, Numerical methods and procedures.

Laminar boundary layer-shock wave interaction are studied in which the pressure rise generated in an external supersonic, inviscid flow is communicated upstream through the boundary layer, and thereby induces flow separation. An integral or moment method is used in which the first moment of momentum is employed, in addition to the usual momentum integral (zeroth moment). By this means the velocity and enthalpy profiled are characterized by a single independent parameter not explicitly related to the local static pressure gradient. This method itself is not new, but it turns out that its successful application to separated and reattaching flows hinges on the proper choice of the one-parameter family of velocity profiles utilized to represent the integral properties of the viscous flow. It is shown that the Stewartson reversed-flow profiles and their Cohen Reshotko analogues for flows with heat transfer have the qualitatively correct behavior; polynomials do not. (Author)

AD-437 799 Div. 9
OTS price $5.60

Cincinnati Univ., Ohio.
THE WEAK INTERACTION THEORY FOR HYPERSONIC FLOW OVER CONES.
Rept. for July 62-Mar 63, by Werner Hoelmer and Maido Saarlas. Mar 64, 58p.
Contract AF33 616 8453, Proj. 7064
ARL 64 37 Unclassified report

Report on Aerothermodynamic Investigations in High Speed Flow.

Descriptors: (*Hypersonic flow, Conical bodies), (*Conical bodies, Hypersonic characteristics), Theory, Boundary layer, Surface temperature, Pressure, Distribution, Mathematical analysis, Model tests, Experimental data, Slender bodies.

The weak interaction effect on cone surface pressures was measured and found to be in good agreement with theory. Correlation was established at a nominal Mach number of 14 with the value of the hypersonic interaction parameter, based on free-stream conditions, ranging from 4 to 20. By using an inverse approach, the cumbersome iteration method suggested by Talbot has been simplified to a one-step calculation. The results are nearly identical with Probstein's first-order theory for values of the hypersonic interaction parameter less than twenty. Computer solutions were found for 5, 10, 15, and 20 degree semivertex angle, sharp-nosed cones at free stream Mach numbers between 5 and 20 and wall to adiabatic wall temperature ratios between .1 and 1. (Author)

AD-437 859 Div. 9
OTS price $1.10

Research Labs. for the Engineering Sciences, Univ. of Virginia, Charlottesville.
LABORATORY INVESTIGATION OF THE BASIC NATURE OF LOW DENSITY GAS FLOW AT HIGH SPEEDS.
Quarterly progress rept. 15 Jul-15 Oct 63, by A. R. Kuhlthau. Jan 64, 9p. Rept. no. AST3530 102 64U
Contract NOrd18211
Unclassified report

Descriptors: (*Superaerodynamics, Molecular beams), (*Molecular beams, Scattering), Test facilities, Supersonic nozzles, Supersonic flow, Gas flow, Magnetic fields, Targets, Rotation.

A quantitative description of the mechanism whereby the neutral molecules of a rarefied gas exchange momentum and energy during collision with a solid surface is the primary objective of the current research program. Molecular beam scattering from a high speed target rotor is to

be employed as a means for the experimental examination of this interaction process. Whether or not the scattered molecules acquire the constant rotor velocity will depend upon the nature of the interaction mechanism, and the technique can be used to differentiate between three possible gas-surface interaction models. (Author)

10. FUELS AND COMBUSTION

AD-436 568 Div. 10
OTS price $1.10

Bureau of Mines, Pittsburgh, Pa.
FIRE AND EXPLOSION HAZARDS OF FLIGHT VEHICLE COMBUSTIBLES.
Quarterly progress rept. no. 1, 2 Jan - 31 Mar 64, by E. L. Litchfield, H. E. Perlee and M. G. Zabetakis. 31 Mar 64, 8p.
Proj. 6075, Task 607504
Unclassified report

Descriptors: (*Liquid rocket propellant, Hazards), (*Liquid rocket oxidizers, Hazards), (*Explosive materials, Liquid rocket materials), Liquid rocket fuels, Oxygen, Hydrogen, Nitrogen, Halogenated hydrocarbons, Flammability, Detonations, Sensitivity, Solidified gases, Liquefied gases, Mixtures, Additives, Hazards, Inhibition, Powders.

The work covered by this report represents two separate areas of endeavor. One part is concerned with the study of the suppression of cryogenic propellant explosions and the other with the determination of the flammability characteristics of selected halogenated hydrocarbons. The work on cryogenic propellant explosions includes a study of the liquid H-solid O and liquid O-RP 1 systems. A study of suppression of gas-phase detonations is also included. The initiation sensitivity of the liquid H-solid O combination was determined by a projectile impact test. Results for the system containing liquid H-solid O-solid N are also described. These indicate that desensitization of the condensed-phase H-O system is possible. Studies indicated that powders do not exhibit suppressant effects comparable to those exhibited by gases and vapors. Autoignition temperatures are being determined for each of four halogenated hydrocarbons. (Author)

AD-436 600 Div. 10
OTS price $2.60

Martin-Marietta Corp., Denver, Colo.
IMPROVED LEAK DETECTION, CORRELATION OF ACTUAL LEAKAGE WITH INSTRUMENT INDICATIONS, EFFECTS OF HUMIDITY ON LEAKS AND CATEGORIZATION OF LEAK INFORMATION.
Progress rept. no. 2,
by C. Fatino, C. Maze and G. Herbst, 31 Mar 64, 24p. Rept. nos. CR64 80, ME540
Contract AF04 647 576
Unclassified report

Descriptors: (*Gas leaks, Detection), (*Propellant tanks, Gas leaks), Gas flow, Fluid flow, Capillary tubes, Nomographs, Humidity, Condensation, Test methods, Welds, Bolted joints, Seals (Stoppers), Nitrogen compounds, Tetroxides, Helium, Air, Hydrogen, Gases, Liquids, Viscosity, Pressure, Liquid rocket fuels, Liquid rocket oxidizers, Water, Methyl hydrazines, Nitrogen, Oxygen, Water vapor, Nitric acid.

Reports on Propellant Ullage Decay (ME no. 495) and Use of a Flow Conversion Nomograph for leaks and Capillaries, (ME no. 484) are presented. The primary purpose of the ullage decay study was to determine a relationship between the helium leak rates and the actual ullage gas leak rates. The results of this study showed that the propellant gases flow at a rate equal to or slower than, helium. In many instances the escaping ullage gas (particularly in the case of nitrogen tetroxide) actually condensed in the leak path and eliminated any further gas leakage. The nomograph (ME no. 484) is submitted for information on flow rate conversions. By use of the nomograph the flow rate of any liquid at any pressure through the same path. The nomograph was developed theoretically; however, the gas portion has been proven experimentally. (Author)

AD-436 714 Div. 10, 27, 30
OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
BURNING RATE MEASUREMENT BY RADIOGRAPHIC EXAMINATION OF OPERATING HYBRID MOTORS.
Rept. for 1 July 62-1 Jan 63,
by Royce E. Monks. Oct 63, 24p.
NOTS TP3252; NAVWEPS 8359
Unclassified report

Descriptors: (*Rocket motors (Hybrid propellant), Burning rate), Hybrid rocket propellants, Combustion, Radioactive isotopes, Measurement, Rocket propellant grains, Thickness, Gamma counters, Scintillation counters, Captive tests, Non-destructive testing, gamma rays, Radiography, Fluid flow.

The design and operation are reported of a laboratory-type continuous monitoring system for use in studies of mass flow rates in operating rocket motors. The system consists of a radioactive gamma source and a scintillator detection system using an activated sodium iodate crystal. The factors affecting the performance as related to the data obtained by such a system are discussed. Experimental data are presented in which propellant mass has been plotted against time for a continuously burning rocket motor. (Author)

AD-437 145 Div. 10
OTS price $12.00

Lockheed Propulsion Co., Redlands, Calif.
SOLID PROPELLANT STRUCTURAL INTEGRITY INVESTIGATIONS. DYNAMIC RESPONSE AND FAILURE MECHANISMS.
Final technical rept.,
by Dalton Cantey. 17 Apr 64, 169p. Rept. no. 618F
Contract AF04 611 8539, Proj. 3059, Task 305911
RPL TDR64 32, vol. 1 Unclassified report

Descriptors: (*Solid rocket propellants, Mechanical properties), Viscoelasticity, Strain (Mechanics), Stresses, Creep, Propellant grains, Failure (Mechanics), Tensile properties, Shear stresses, Aging (Materials), Solid rocket propellant binders, Dielectric properties, Polymers.

This document presents the results and conclusions of a theoretical and experimental research program to correlate mechanical response and failure in solid propellants with basic material structural characteristics. The program was concentrated on the study of propellant dynamic physical properties and structural failure phenomena. Major emphasis in the program, directed at the complementary problems of propellant viscoelastic properties and failure mechanisms together with examination of the effects of propellant binder and filler physical characteristics on these general aspects of its behavior,

is reported upon. Measurements of viscoelastic properties of various propellants using transient techniques are demostrated and results are presented. Investigation of propellant viscoelastic properties in dynamic shear is also discussed. Failure criteria studies are presented in which propellants were tested to failure in one and two-dimensional stress states, as are systematic relationships between physicochemical formulation variations and propellant failure characteristics. Conclusions are given on the isolation of a maximum tensile stress failure criterion. (Author)

AD-437 222 Div. 10, 30
OTS price $1.10

Malaker Labs., Inc., Highbridge, N. J.
Kinetic study of rocket exhaust gases.
Quarterly progress rept. no. 8 for period ending 16 Apr 64. 16 Apr 64, 9p. Rept. no. 103 8
Contract DA30 069ORD2918, Proj. 1A22901A211
Unclassified report

Descriptors: (*Exhaust gases, Flames), (*Flames, Rocket propellants), (*Temperature, Measurement), Photographic analysis, Photographic analysis, Photographic images, Spectrographic cameras, Brightness, Intensity, Light, Emissivity, Mathematical analysis.

AD-437 384 Div. 10, 22
OTS price $1.60

IIT Research Inst., Chicago, Ill.
A STUDY OF THE FUNDAMENTALS OF LIQUID PROPELLANT SENSITIVITY.
Progress rept. no. 2,
by Ted Erikson. 10 Mar 64, 19p. Rept. no. C 6024 8
Contract AF04 611 9566
Unclassified report

Descriptors: (*Liquid rocket propellants, Detonations), (*Detonations, Explosive materials), (*Sensitivity, Explosive materials), (*Explosive materials, Detonations), Lead compounds, Ozides, Shock tubes, Shock waves, Low-temperature research, Nitrogen, Air, Light, Temperature, Test equipment.

Preliminary sensitivity tests of lead azide samples, with initial temperatures to -170 C, were performed in the new cryogenic IITRI shock-tube facility. Detonations were generally identified within 200 microseconds of the time that incident Mach 2.6 nitrogen shocks were reflected from the surface of the sample. Two characteristic induction periods were noted. The first period can be considered typical. The second period exhibited an increasing light output which stabilizes. Subsequent light output jumps instantaneously and work output follows within 10-20 microseconds. An appreciable sensitivity increase was identified with traces of air (oxygen) in the driven gas and lowered initial azide sample temperatures of 200 C; at otherwise constant conditions time delays decreased by factors of 10 and 2, respectively. (Author)

AD-437 581 Div. 10, 26
OTS price $2.60

General Electric Co., Philadelphia, Pa.
PROPELLANT STORABILITY IN SPACE.
Quarterly rept. no. 3, 1 Feb-31 Mar 64,
by R. Carr, A. Cohen, C. Lankton and B. Zeldin.
Apr 64, 26p.
Contract AF04 611 9078, Proj. 6753, Task 675301
RPL TDR64 56 Unclassified report

Descriptors: (*Liquid rocket propellants, Storage), (*Storage, Liquid rocket propellants), (*Space environmental conditions, Liquid rocket propellants), Diameter, Propellant tanks, Low-pressure research, Simulated environment, Solar radiation, Shielding, Meteorites, Infrared radiation, Nitrogen, Liquified gases, Oxygen, Diboranes, Hydrogen, Oxygen, Fluorine compounds, Cryogenics.

Details of the preparation for the second series of tests in the Solar Environmental Simulation are discussed. Results of the second test series are compared with those obtained in the first test. In terms of steady state data, the second test yielded excellent results. The numerical information indicates that insulated tankage systems do not perform as well as predicted, but do give adequate protection for long term storage. The performance of large tanks is superior to that of smaller units. (Author)

AD-437 646 Div. 10
OTS price $4.60

Instituto Nacional de Technica Aeronautica, Madrif (Spain).
ON THE STRUCTURE OF LAMINAR DIFFUSION FLAMES,
by Amable Linan. 1 Jun 63, 44p. Rept. no.
TR FM 63 2
Grant AF EOAR 63 43
Unclassified report

Descriptors: (*Flames, Configuration), (*Diffusion, Flames), (*Reaction kinetics, Flames), Combustion, Chemical reactions, Spain, Laminar flow, Equations of state, Fuels, Oxidizers, Equations, Theory, Mathematical analysis, Boundary layer, Partial differential equations.

The structure of laminar diffusion flames is analyzed in the limiting case of large, although finite, reaction rates. It is shown that the chemical reaction takes place only in a very thin region or chemical boundary layer where convection effects may be neglected. Then the temperature and mass fraction distributions within the reaction zone are obtained analytically. The flame position, rates of fuel consumption, and temperature and concentration distributions outside of the reaction zone may be obtained by using the assumption of infinite reaction rates. For large Reynolds numbers mixing and combustion take place in boundary layers and free mixing layers. And again analytical solutions are obtained for the temperature and mass fraction distributions outside of the reaction zone. (Author)

AD-437 772 Div. 10
OTS price $2.60

Rohm and Haas Co., Huntsville, Ala.
ENGINEERING RESEARCH.
Quarterly progress rept. 10 Dec 63-10 Mar 64.
23 Apr 64, 27p. Rept. no. P64 6
Contracts DA01 021ORD11878z; DA01 021ORD11909z
Unclassified report

Descriptors: (*Solid rocket propellants, Processing), Thermal conductivity, Specific heat, Aging (Materials), Calorimeters, Diffusion, Propellant grains, Programming languages, Math-

ematical models, Dynamics, Combustion products, Rocket motor nozzles, Stresses, Deformation, Mathematical analysis, Viscoelasticity, Composite materials, Rocket cases.

Progress during the quarter was summarized for all projects being conducted by the Applied Mechanics Group and the Applied Thermodynamics Group of the Engineering Research Section. Projects by title consisted of Thermal Properties of Propellants, Determination of Curing Kinetics, Analysis of Diffusion Processes Coupled to Chemical Reactions in Solid Propellant Grains, Analysis of Flow Reactors, Analysis of the DTA Test, Dynamic and Thermal Non-Equilibrium in Two-Phase Flow in Rocket Nozzles, Conformal Mapping and Determination of Stresses in Star-Perforated Grains, Development of Approximate Methods of Viscoelastic Stress Analysis, Thermal Stresses in Viscoelastic Materials, Mechanics of Curing Propellants, Mathematics of Composite Materials, Stress Analysis of Infinite Cones Under Axial Acceleration, Analysis of Stress Singularities, Analysis of the Biaxial Strip Test, and Development of Stress Analysis Programs Based on the Finite-Element Method. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-436 409 Div. 11, 31
OTS price $13.00

Army Transportation Research Command, Fort Eustis, Va.
LIGHTER, AMPHIBIOUS, RESUPPLY, CARGO, 15-TON (LARC-XV),
by John F. Sargent and John W. Sobczak. Aug 63, 186p.
Task 1D443012D25605
ATRECOM TN63 41 Unclassified report

Descriptors: (*Amphibious vehicles, Performance (Engineering)), Stability, Velocity, Internal combustion engines, Tests, Terrain, Propellers (Marine), Modification kits, Vibration, Water, Torque, Radiofrequency interference.

This report contains the results of engineering tests conducted on the LARC-XV-IX. The objective of the tests was twofold: (1) to determine the adequacy of modifications incorporated after completion of the original engineering tests performed by the contractor and (2) to determine whether the modifications comply with the military and technical characteristics. The tests conducted on the LARC-XV-IX were divided into three main categories: static, performance in water, and performance on land. In addition, supplemental tests were conducted to determine (1) the LARC's dynamic stability, (2) the adequacy of the gydrqulic system, (3) the degree of torsional vibration, and (4) the engine horsepower. Testing was not as complete as was desired because of weather and lack of time. The mofications to the LARC-XV prior ot the supplemental tests proved satisfactory. Also, subsequent modifications for stability and for hydraulic-system reliability appeared satisfactory (although the usual 1,000-hour test was not completed). Therefore, it is concluded that the production design for the LARC-XV, based on these modifications, will meet most of the military and technical characteristics. (Author)

12. GUIDED MISSILES

AD-435 147 Div. 12, 6
OTS price $2.60

Santa Barbara Research Center, Goleta, Calif.
IMPROVEMENT STUDY OF RDU'S ON SIDEWINDER 1C.
Final rept.,
by E. W. Peterson. 20 Nov 63, 24p.
Contract N123 60530 32082A, Proj. CS05520
Unclassified report

Descriptors: (*Guided missiles (Air to air), Heat homing), Infrared detectors, Cryostat, Containers, Coatings, Liquid metal coolants, Heat exchangers, Coatings, Nickel, Plating, Refrigeration systems, Temperature control.

AD-435 467 Div. 12
OTS price $2.50

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
RANDOM VIBRATION STUDIES OF COUPLED STRUCTURES IN ELECTRONIC EQUIPMENTS.
Rept. for 15 Nov 62-15 June 63,
by Denis U. Noiseux, Charles W. Dietrich, Ewald Eichler and Richard H. Lyon. Mar 64, 103p.
Contract AF33 657 9118, Proj. 1309, Task 130904
ASD TDR63 205, vol. 2.
Unclassified report

Report on Flight Vehicle Environmental Investigations.

Descriptors: (Guided missiles (Surface-to-surface), Electronic equipment), (*Electronic equipment, Vibration), Structures, Acoustics, Stresses, Acoustic impedance, Guided missile computers, Sound, Mechanical waves, Power, Measurement, Beams (Structural), Metal plates, Mathematical analysis, Model tests.

The previous report ASD TDR 63 205, (AD-405 919) and the present one study two main areas: the replacement of acoustic excitation by direct mechanical excitation and the response of substructures tied to a randomly vibrating primary structure. This report presents techniques of measurement of power flow from a shaker to a structure, a detail analysis of the case of edge connections, the results of mechanical simulation of an acoustic test applied to a model electronic package, and a discussion of acoustic and vibration tests performed on an Atlas Guidance Computer. (Author)

AD-435 503 Div. 12
OTS price $6.60

Foreign Tech., Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
STATIONS IN SPACE (SELECTED ARTICLES).
10 Feb 64, 65p.
FTD TT63 1041 Unclassified report

Trans. from Stantsii V Kosmose, Sbornik Statey, Izd-Vo An SSSR, Moskva, pp. 42-46, 49-54, 66-68, 214-223, 224-229, 234-238, 259-264, 272-275, 284-288, 291-299, 376-380, 1960.

Descriptors: (*Space flight, USSR.), Satellites (Artificial), Manned spacecraft, Space capsules, Weightlessness, Space environmental conditions, Lunar craft, Mars probes, Lunar probes, Instrumentation, Cosmic rays.

Division 12 - GUIDED MISSILES

AD-435 551 Div. 12
OTS price $1.10

Naval Research Lab., Washington, D. C.
DECAY PREDICTION OF 1963-21 USING U.S. NAVAL SPACE SURVEILLANCE SYSTEM OBSERVATIONS.
Final rept.,
by R. Brescia, D. Ballou and R. Zirm. 2 Mar 64, 8p.
NRL 6049 Unclassified report

Descriptors: (*Reconnaissance sattellites, Life expectancy), Orbital trajectories, Transfer trajectories, Malfunctions, Space surveillance systems, Time , Curve fitting, Multilaunching, Injection.

The multiple launch of 1963-21 suffered a malfunction in the orbital injection motor that left the orbiting bodies in the transfer ellipse rather than the intended circular orbit of 500 miles. Because of the approximately 100-mile-high perigees, the periods of the several objects decayed to reentry in time intervals of some 2 to 8 weeks. Early observation suggested that decay rates were approximately inversely proportional to the ballistic coefficients. From this, it was possible to predict the reentry times of the longer lasting satellites from the behavior of the first one to reenter. Simple curve fitting was tried as a method of refining predictions. (Author)

AD-435 741 Div. 12, 9
OTS price $4.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
CHEMICALLY REACTING BOUNDARY LAYERS,
by M. Lenard. Mar 64, 41p. Rept. no. R64SD14
Contract AF04 694 222
Unclassified report

Descriptors: (*Plasma sheath, Chemical properties), (*Electron density, Plasma sheath), (*Boundary layers, Chemical reactions), Atmosphere entry, Gas ionization, Laminar boundary layer, Air, Conical bodies, Re-entry vehicles, Electrons, Mathematical models, Axially symmetric flow, Transport properties, Differential equations, Nitrogen, Oxygen, Nitrogen compounds, Oxides, Nose cones.

Numerical calculations of the chemically reacting laminar air boundary layer equations are presented at several points along cone-shaped reentry bodies at several flight conditions and different wall temperatures. These results use a seven component, ten reaction model of air (N, O, N2, O2, NO, NO+, e-). Thermodynamic and transport properties are completely general and use the latest available information. The solutions are based on the assumption of local similarity. The resulting electron densities are noted. (Author)

AD-435 888 Div. 12, 30
OTS price $1.60

Boeing Co., Seattle, Wash.
QUALIFICATION TEST REPORT FOR MODEL SPECIFICATION S-133-120-6-7 AND QUALIFICATION SUPPLEMENT I THEREOF, TEST ADAPTER GROUP, AN/GSM-61,
by A. J. Mateu. 27 Sep 63, 12p. Document no. D2 7992 2
Contract AF04 647 289
Unclassified report

Descriptors: (*Test equipment, Guided missiles (Surface-to-surface)), (*Guided missiles (Surface-to-surface), Test equipment), Frequency, Specifications, Military requirements, Radiofrequency interference, Test method.

AD-436 006 Div. 12
OTS price $1.10

Boeing Co., Seattle, Wash.
QUALIFICATION TEST REPORT FOR MODEL SPECIFICATION S-133-120-6-13 AND QUALIFICATION SUPPLEMENT I THEREOF, MESSAGE GENERATOR, MX-3625/GSM-62,
by A. J. Mateu. 25 Sep 63, 10p. Document no. D2 12030 2
Contract AF04 647 289
Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Checkout procedures), (*Guided missile systems), Command and control systems.

AD-436 449 Div. 12
OTS price $1.10

Martin-Marietta Corp., Denver, Colo.
POST FIRING CAPTIVE TEST REPORT. MISSILE SM68B-4. MISSILE VERIFICATION FIRING,
by H. B. Coulon. 1964, 4p. Rept. no. CR64 44
Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Performance (Engineering)), Checkout procedures, Tests, Vibration, Manned Spacecraft, Satellites (Artificial), Launching, Deflection, Calibration, Reliability, Airframe, Electrical equipment, Flight control systems, Propellant, Rocket engine, Flight testing.

AD-436 748 Div. 12, 8
OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
FINAL DESIGN SPECIFICATIONS FOR NIKE-CAJUN VOLTAGE BREAKDOWN INSTRUMENTATION PACKAGE AND GROUND SUPPORT EQUIPMENT,
by John B. Chown and Michael G. Keenan.
Nov 59, rev. July 60, 23p.
Contract AF19 604 5483, SRI Proj. 2879
Unclassified report

Descriptors: (*Sounding rockets, Instrumentation), Rocket antennas, Specifications, Voltage, Effectiveness, Antenna configurations, Slot antenna, Telemetering antennas, Very high frequency, X band, Environment, Communication systems, Ionosphere, Very low frequency, Wave transmission, Transmitter receivers, Space environmental conditions, Weight, Volume, Detectors, Rocket trajectories, Ground support equipment.

AD-436 777 Div. 12, 8
OTS price $1.60

Sylvania Electric Products Inc., Waltham, Mass.
GROUND ELECTRONICS SYSTEM FOR WS-133B (MINUTEMAN). MASTER SPECIFICATION INDEX, FIFTH REVISION, DATED 15 APR '64,
by W. Brown. 15 Apr 64, 13p.
Contract AF04 694 261
Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Specifications), Guided missile components, Electronic equipment, Test sets.

AD-436 805 Div. 12
OTS price $26.00

Space Technology Labs., Redondo Beach, Calif.
OSTF-II. TEST OBJECTIVE 026 (MATH MODEL) OF

INTEGRATED TEST PLAN FOR WS 107A-1 OPERATIONAL SYSTEM TEST FACILITY OSTF-II CATEGORY II INCLUDING ESTIMATES FOR ATLAS F OPERATIONAL WEAPON SYSTEM (ATLAS F). VOLUME 3. APPENDICES.
Final reliability summary rept.
15 Nov 63, 1v. Rept. no. 6301 6596RU000
Contract AF04 694 3
BSD TDR64 8, vol. 3 Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Reliability), Silos, Mathematical models, Automatic pilots, Guided missile launchers, Launching, Air conditioning equipment, Liquid level control, Liquid rocket propellants, Malfunctions, Reports.

This report describes the results of the Atlas F Reliability Mathematical Model Study conducted as an analytical part of the OSTF-2 test program. The report is presented in three volumes, and defines development of the models (Volume I), generation of reliability estimates for various combinations of weapon system operating conditions (Volume 2), includes the appendices containing associated studies performed during the program (Volume 3), and the final evaluation of the Reliability of the Weapon System Operating Conditions with an input data cutoff date of 11 December 1963 (Annex No. 1). (Author)

AD-436 836 Div. 12
OTS price $1.60

Kiruna Geophysical Observatory (Sweden).
THE GEOGRAPHICAL DISTRIBUTION OS SATELLITE SCINTILLATION ACTIVITY ABOVE NORTHERN SCANDINAVIA,
by Ludwik Liszka. 10 Feb 64, 19p. Rept. no. SR4
Contract AF61 052 678
AFCRL 64 268 Unclassified report

Descriptors: (*Brightness, Spacecraft), (*Geography, Distribution), Reentry vehicles, Maps, Sweden, Van Allen radiation belt, Atmosphere.

The geographical distribution of scintillation activity above northern Scandinavia is studied. The apparent agreement obtained between contours of constant scintillation activity and lines L = const may be interpreted in terms of a connection between the scintillation phenomenon and the radiation belt. (Author)

AD-436 837 Div. 12
OTS price $3.60

Space Technology Labs., Inc., Redondo Beach, Calif.
ATLAS F. OSTF-II TEST OBJECTIVE 026 (MATH MODEL) OF INTEGRATED TEST PLAN FOR WS107A-1 OPERATIONAL SYSTEM TEST FACILITY OSTF-II CATEGORY II INCLUDING ESTIMATES FOR ATLAS F OPERATIONAL WEAPON SYSTEM. VOLUME 1. DEVELOPMENT OF MODELS.
Final reliability summary rept.
15 Nov 63, 32p. Rept. no. 6301 6594RU000
Contract AF04 694 3
BSD TDR64 8, vol. 1 Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface), Mathematical models), Reliability, Weapon systems, Air force, Failure (Mechanics), Tests, Data, Guided missile components, Ground support equipment.

This report describes the results of the Atlas F Reliability Mathematical Model Study conducted as an analytical part of the OSTF-2 test program. The report is presented in three volumes, and defines development of the models (Volume I), generation of reliability estimates for various combinations of weapon system operating conditions (Volume 2), includes the appendices containing associated studies performed during the program Volume 3), and the final evaluation of the Reliability of the Weapon System Operating Conditions with an input data cutoff date of 11 December 1963 (Annex No. 1). (Author)

AD-436 876 Div. 12
OTS price $3.60

Boeing Co., Seattle, Wash.
MINUTEMAN ACCIDENT/INCIDENT REPORTING PROCEDURES,
by W. O. Reynolds. 16 Oct 63, 40p. Document no. D2 7987
Contract AF04 647 289
Unclassified report

Descriptors: (*Guided missile safety, Accidents), Hazards, Safety, Research program administration, Management engineering, Fires, Explosions, Reports.

AD-436 894 Div. 12
OTS price $1.60

Electric Products, Inc., N. Y.
GROUND ELECTRONICS SYSTEM FOR WS-133B (MINUTEMAN). FACILITIES DESIGN CRITERIA STRATEGIC MISSILE SUPPORT BASE WING VI - GRAND FORKS AIR FORCE BASE (SUPPLEMENT),
by J. C. Berlinguet Jr. 6 Mar 64, 17p. Rept. no. MPO SR17 3 306 1
Contract AF04 694 261
Unclassified report

Descriptors: (*Ground support equipment, Electronic equipment), Maintenance, Electrical equipment, Guided missiles (Surface-to-surface), Maintenance equipment, Storage, Design, Air Force, Test facilities.

AD-437 165 Div. 12
OTS price $2.60

Northrop Corp., Hawthorne, Calif.
OPTICAL PROJECTION IMAGE EVALUATION FOR TERMINAL GUIDANCE SIMULATOR STUDY PROGRAM.
Apr 64, 24p. Rept. no. NB64 78
Unclassified report

Descriptors: (*Terminal Guidance, Simulation), Optical images, Simulators, Tests, Television display systems, Television equipment, Analog computers, Optical scanning, Viewing screens, Photographic images, Film projectors, Flight simulators, Human engineering.

The total sine wave response of the Terminal Guidance Simulator from the test transparency to the display results from cascading the responses of the optical projection section and the television/display system. It was desired to obtain the optical responses at different magnifications and fields of view and thereby obtain a measure of the system resolution characteristics at various points throughout the simulated mission. This data, along with system transfer data and signal to noise characteristics, can be used to determine image quality with relation to the photographic transparency. The experiment concerns the electro-optical projection section. It was determined that the simulator N sube varies up to 12 percent for a 3:1 change in square area viewed. The N sube is constant within 10 percent over 90 percent of the total simulated run for the 10 to 15 square mile fields of view and has less than 15% variance for 87% of the total run for the 5-square mile field of view. The maximum variation in values for 55 seconds of the run are summarized. (Author)

AD-437 279 Div. 12, 9
OTS price $12.00

General Electric Co., Philadelphia, Pa.
SUPPORTING RESEARCH STUDIES.
Final rept. 1 Jan 59-30 June 61.
31 July 61, 164p. Document no. 61SD529
Contract AF04 647 269
Unclassified report

Report on Advanced Reentry Vehicle Study Program.

Descriptors: (*Reentry vehicles, Research program administration), High temperature research, Absorption, Relaxation time, Hypersonic flight, Schlieren photography, Gases, Blunt bodies, Stagnation point, Temperature, Heat transfer, Hypersonic flow, Shock waves, Shock tubes, Shock (Mechanics), Ionization, Air, Dynamics, Mercury, Thermal conductivity, Magnetohydrodynamics, Plasma physics, Gas ionization, Helium, Viscosity, Aerodynamic control surfaces, Fins, Flaps, Boundary layer, Spheres, Conical shapes, Refraction, Transport properties.

AD-437 312 Div. 12
OTS price $5.60

Sylvania Electric Products Inc., Waltham, Mass.
GROUND ELECTRONICS SYSTEM FOR WS-133B (MINUTEMAN). FACILITIES DESIGN CRITERIA. NEW OPERATIONAL STRATEGIC MISSILE SUPPORT BASES,
by J. C. Berlinguet, Jr. 6 Mar 64, 54p. Rept. no. MPO SR17 3 306
Contract AF04 694 261
Unclassified report

Descriptors: (*Ground support equipment, Guided missiles (Surface-to-surface)), (*Launching sites, Guided missiles (Surface-to-surface)), Design, Maintenance, Maintenance equipment, Military requirements.

AD-437 354 Div. 12
OTS price $6.60

Boeing Co., Seattle, Wash.
FTM 443 MODEL SPECIFICATION S 133 1000 0 1.
Acceptance summary rept.
by J. H. Kirby. 1 Apr 64, 66p. Document no. D2 3929 443
Contract AF04 694 422
Unclassified report

Descriptors: (*Guided missiles (Surface-to-surface, Research program administration), Management engineering, Test vehicles, Military requirements, Specifications, Guidance, Control, Booster motors, Second-stage motors, Third-stage motors, Guided missile components, Quality control.

AD-437 356 Div. 12
OTS price $2.60

Sylvania Electric Products, Inc., Waltham, Mass.
GROUND ELECTRONICS SYSTEM FOR WS-133B (MINUTEMAN). INSTRUMENTATION PLAN FOR MISSOURI TEST PROGRAM.
14 Apr 64, 25p. Rept. no. MPO PD 0040, rev. 3
Contract AF04 694 261
Unclassified report

Descriptors: (*Ground support equipment, Test equipment), Guided missiles (Surface-to-surface), Electronic equipment, Measurement, Recording systems, Monitors, Attenuators.

An Instrumentation Plan is presented to provide a data acquisition system for obtaining data duing integration and performance testing of the Radio Subsystem. (Author)

AD-437 379 Div. 12
OTS price $3.60

Naval Weapons Lab., Dahlgren, Va.
POINTING AND FIRING ZONES FOR ITALIAN SHIP C. T. ''IMPAVIDO'',
by J. L. Lindsey and T. A. Trant. 13 Mar 64, 35p.
NWL 1910 Unclassified report

Descriptors: (*Guided missile launchers, Naval vessels (Combatant)), Fire control systems, Guided missile safety, Launching, Hazards, Shipborne, Guided missiles (Surface-to-air), Navy, Italy, Design.

This report presents the factors considered in the computation and analysis required in the determination of guided missile pointing and firing zones for the Italian Ship C. T. IMPAVIDO. The pointing and firing zones are defined and a structural Grid Chart is given. The C. T. IMPAVIDO is a Military Assistance Program ship which employs a MARK 116 MOD 0 launcher in a MARK 13 MOD 0 launching system. (Author)

AD-437 475 Div. 12
OTS price $14.00

Aeronutronic, Newport Beach, Calif.
GENERAL PERTURBATION TECHNIQUES FOR SATELLITE ORBIT PREDICTION STUDY. VOLUME II. APPENDIXES I-VII,
by J. L. Arsenault, J. D. Enright and C. Purcell.
Apr 64, 207p.
Contract AF04 695 326, Proj. 3181, Task 318104
AL TDR64 70, vol. 2 Unclassified report

Descriptors: (*Perturbation theory, Programming (Computers)), (*Orbital trajectories, Programming (Computers)), (*Programming (Computers), Oribtal trajectories), Satellites (Artificial), Bibliographies, Celestial mechanics, Mathematical prediction, Gravity, Position finding, Reviews, Mathematical analysis.

AD-437 476 Div. 12
OTS price $10.50

Aeronutronic, Newport Beach, Calif.
GENERAL PERTURBATION TECHNIQUES FOR SATELLITE ORBIT PREDICTION STUDY. VOLUME I. STUDY AND RESULTS.
Rept. for Mar 63-Apr 64,
by J. L. Arsenault, J. D. Enright and C. Purcell.
Apr 64, 135p. Pub. no. U 2556, vol. 1
Contract AF04 695 326, Proj. 3181, Task 318104
AL TDR64 70, vol. 1 Unclassified report

Report on Guidance for Space Systems.

Descriptors: (*Orbital trajectories, Mathematical prediction), Perturbation theory, Celestial mechanics, N-body problem, Tracking, Errors, Satellites (Artificial), Motion.

The available published General Perturbations solutions for satellite motion about an oblate planet are surveyed and systematically tabulated. This tabulation is used in a qualitative analysis leading to the selection of techniques best suited for satellite orbit prediction. The theories adopted for programming and quantitative analysis are those of Brouwer; Izsak; Hall, Gawlowicz and Vahradian; Petty and Breakwell; and that of Aeronutronic. Parametric comparisons between these theories and a Special Perturbations method, presented in graphical form, provide a means for evaluating the orbit prediction characteristics of the theories. (Author)

AD-437 493 Div. 12, 22
OTS price $9.10

Army Missile Command, Redstone Arsenal, Huntsville, Ala.
INVESTIGATION OF FIN GAP EFFECTS ON STATIC STABILITY CHARACTERISTICS OF FIN STABILIZED MISSILES, by T. L. Killough. 10 Apr 64, 109p.
AMC RA RF TR64 6 Unclassified report

Descriptors: (*Fin-stabilized ammunition, Design), Transonic wind tunnels, Stability, Fins, Angle of attack, Experimental data, Theory, Cylindrical bodies, Models (Simulations), Trailing control surfaces, Guided missiles, Projectiles, Aerodynamic characteristics.

AD-437 494 Div. 12
OTS price $5.60

AC Spark Plug Div., General Motors Corp., Milwaukee, Wis.
PROGRAM 624A - TITAN III, INERTIAL GUIDANCE SYSTEM. RELIABILITY AND QUALITY ASSURANCE PROGRAM STATUS.
Quarterly program progress rept., 1 Jan-31 Mar 64.
30 Apr 64, 60p. Rept. no. I 025
Contract AF04 695 282
Unclassified report

Descriptors: (*Launch vehicles (Aerospace), Inertial guidance), Research program administration, Booster rockets, Reliability, System engineering, Guidance, Design, Measurement, Guided missile computers, Computers, Checkout equipment, Azimuth, Storage, Power supplies, Telemeter systems, Test equipment, Test methods, Training, Logistics, Maintenance, Quality control.

Development of the Program 624A - TITAN III Inertial Guidance System during the period 1 January through 31 March 1964 proceeded on schedule. Satisfactory progress was made in all areas of system design and development, test program preparation, reliability and quality assurance, and related support activities. (Author)

AD-437 525 Div. 12
OTS price $4.60

Aerospace Corp., Los Angles, Calif.
DERIVATION OF THE GUIDANCE EQUATIONS FOR THE USAF ATHENA,
by L. K. Herman, R. M. Allman, and B. Katz.
30 Mar 64, 44p. Rept. no. TDR269 4810 31 1
Contract AF04 695 269
BSD TDR64 37 Unclassified report

Descriptors: (*Hypersonic test vehicles, Midcourse guidance), (*Midcourse guidance, Reentry vehicles), Equations, Radar tracking, Corrections, Command guidance, Guided missile trajectories, Attitude control systems, Differential equations, Integration, Taylor's series, Real time, Mathematical prediction, Reentry vehicles, Nose cones.

The USAF ATHENA is a re-entry test vehicle which has four solid propellant stages. A midcourse correction type of guidance is used to compensate for boost dispersions by adjusting the third stage attitude and ignition time. The guidance computations are performed in a ground based digital computer using radar data obtained after second stage burnout. Because this is a re-entry test vehicle, the guidance system must cause the payload to meet various re-entry constraints as well as the usual impact point constraint. The complete derivation of the guidance equations and a description of the entire guidance loop are presented in this report. (Author)

AD-437 638 Div. 12
OTS price $5.60

Sylvania Electric Products, Inc., Waltham, Mass.
GROUND ELECTRONICS SYSTEM FOR WS-133B (MINUTEMAN), by J. C. Berlinguet Jr., K. D. Chase and Paul W. Brown. 6 Mar 64, 54p. Rept. no. MPO SR17 3 404
Contract AF04 694 261
Unclassified report

Descriptors: (*Ground support equipment, Military requirements), Design, Guided missiles (surface-to-surface), Military facilities, Launching sites.

This issue of the Facilities Design Criteria, Strategic Missile Support Base, Vandenberg Air Force Base has been updated to include the latest space, environmental, utilities and structural requirements estimates, based on current equipment design philosophy. This issue reflects information submitted to B.S.D., BSSFQ Norton Air Force Base, San Bernading, California, on 6 March 1964. (Author)

AD-437 804 Div. 12, 2
OTS price $5.60

Eastman Kodak Co., Rochester, N.Y.
MEASUREMENT OF 15-MICRON HORIZON RADIANCE FROM A SATELLITE.
1 Mar 63, 56p. Rept. no. ARD ED995, Z3112
Contract AF04 695 160
Unclassified report

Descriptors: (*Satellites (Artificial), Orbital trajectories), Thermal radiation, Measurement, Radiometers, Instrumentation, Bolometers, Preamplifiers, Lenses, Mirrors, Circuits, Wiring diagrams, Calibration, Carbon dioxide, Temperature, Signal-to-noise ratio, Diurnal variations, Tests, Atmosphere models, Sky.

An orbital test program has been conducted providing radiometric measurement of the sky-CO2 horizon profile. The test program was successful and from the results the following conclusions may be drawn: 1. The radiant emittance of the earth's atmosphere, as measured in the CO2 absorption region from an orbiting satellite, agrees with predicted levels; 2. The variations in the radiant emittance for all conditions encountered during the experiment are small; 3. The horizon profile is not appreciably affected by vehicle altitude, latitude, or sun illumination; 4. No appreciable brightening (or darkening) at the earth's limb is apparent. (Author)

AD-437 806 Div. 12
OTS price $10.50

Aerospace Information Div., Washington, D. C.
MATERIALS ON VOSTOK-5, VOSTOK-6, AND POLET-1 FLIGHTS.
2 Mar 64, 131p.
AID U64 9 Unclassified report

Descriptors: (*Manned spacecraft, USSR), Research program administration, Spacecraft, Manned, Launching, Experimental data, Television equipment, Radio equipment, Flight clothing, Human engineering, Life support, Command and control systems, Atmosphere entry, Communication systems, Flight control systems,

Man, Women, Astronauts, Training, Maneuverability, Aerospace craft, Space medicine, Flight testing.

This report, prepared in response to AID Work Assignment No. 57, contains material drawn from Soviet and Soviet-bloc open literature and covers information on the Vostok-5, Vostok-6, and Polet-1 flights and general data on Soviet manned space flights. Data relating to the Vostok-5 and Vostok-6 flights are discussed in sections B, C, D, E, and F; section G discusses data on the Polet-1 flight, while Appendix I contains general data on the Vostok series of Soviet manned space flights. Discussion of the Soviet space program (sections A, B, and G) is felt to be the most significant material in this report. (Author)

AD-437 829 Div. 12
OTS price $2.60

Redstone Scientific Information Center, Redstone Arsenal, Ala.
FOUR DAYS IN SPACE,
tr. by George N. Kasachkoff. 4 Feb 63, 23p.
RSIC T2 63 Unclassified report

Descriptors: (*Manned spacecraft, Space flight), (*Space capsules, USSR), Construction, Astronauts, Quality control, Reliability, Data processing systems, Computers, Orbital trajectories, Preparation, Launching, Checkout procedures, Scheduling, Rendezvous trajectories.

AD-437 895 Div. 12
OTS price $1.00

Air Force Flight Dynamics Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
OPTIMIZATION TECHNIQUES - A COMPARISON,
by L. Schwartz. Mar 64, 32p.
Proj. 8219, Task 821904
FDL TDR64 21 Unclassified report

Descriptors: (*Attitude control systems, Satellites (Artifical)), (*Satellite attitude, Optimization), Mathematical analysis, Calculus of variations, Dynamic programming, Feedback.

A single-axis satellite attitude control system is used as an example for the application of several optimization techniques. The vehicle and actuator dynamics are linear and the performance criterion is quadratic (related to minimum-energy control). The techniques used are the classical calculus of variations, the maximum principle, dynamic programming, and steepest descent. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-435 608 Div. 13, 2
OTS price $2.60

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
TUNNELING IN PERMAFROST, II,
by George K. Swinzow. Jan 64, 30p.
CRREL TR91 Unclassified report

Descriptors: (*Permafrost, Construction), Materials, Mining engineering, Explosives, Geology, Greenland, Underground structures, Furniture.

During the 1960 field season, the permafrost tunnel, begun in 1959 in the Tuto area in Greenland, was extended to 605 ft and three rooms were excavated off the main drift. Mining methods and equipment are described and evaluated. The action of explosives on permafrost was investigated and various types of powder are evaluated. The use of advantages provided by the cold environment was demonstrated. A new building material permacrete, was successfully used and its application demonstrated. The glaciology of the region is re-examined in the light of evidence revealed by excavation. It is concluded that permafrost provides a safe underground shelter and that permacrete presents a most suitable material for fortification. (Author)

AD-436 261 Div. 13
OTS price $4.60

Research Triangle Inst., Durham, N. C.
IMPROVEMENT OF PROTECTION DATA BASE FOR DAMAGE ASSESSMENT AND DATA BASE ON SHELTER NEEDS: AN EXAMINATION OF THE 'PV' DATA FROM THE NFSS. VOLUME III.
Final rept.,
by Philip McMullan, Herbert Campbell and Kenneth Willis. 4 Apr 64, 43p. Rept. no. R OU82 83
Contract OCD OS62 144
Unclassified report

Descriptors: (*Shelters, Vulnerability), Tables, Nuclear warfare casualties, Structures, Civil defense systems, Nuclear explosion damage, Mathmatical models, Mathmatical prediction, Survival, Casualties, Mathematical analysis.

The purpose of the research reported is to examine the sensitivity of direct weapons effects fatality computations to the changes in structural protection indicated by the Physical Vulnerability (PV) data from the National Fallout Shelter Survey (NFSS). An analysis of three typical cities subjected to direct weapons effects shows that when available NFSS shelters are utilized rather than residential dwellings alone, predicted fatalities based on Dikewood Corporation fatality curves decrease by at most 10% of the city's population. This analysis holds the population distribution and weapon characteristics invariant while changing only the structural protection afforded shelterees. It is unlikely that the reduction would approach this percentage except for a few selected city-attack combinations. It is recommended that no PV modifications be made in existing damage assessment routines for national assessments, even though only residential dwelling protection is assumed, until a further study of direct effects casualties in basements and core areas of NFSS structures is completed by the Dikewood Corporation. (Author)

AD-437 133 Div. 13, 2
OTS price $1.60

Army Cold Regions Research and Engineering Lab., Hanover, N.H.
CIRCULAR PLATES ON ELASTIC, SEALED FOUNDATIONS,
by D. E. Nevel. Dec 63, 18p.
Proj. 8S66 02 001 01, Task 5010 02201
CRREL RR118 Unclassified report

Descriptors: (*Ice, Construction), (*Foundations (Structures), Polar regions), Materials, Deflection, Moments, Shear stresses, Graphics, Disks, Differential equations, Elasticity, Landing fields.

The observation that newly frozen ice sheets, resulting from pools of water freezing over, support more than would be predicted by ordinary theory is assessed. A solution is presented for a circular plate on an elastic, sealed foundation. Graphical results are shown for supports at the circumference of the plate. Graphs to obtain moments in a circular plate on an elastic bearing surface, using a sealed or unsealed foundation, are compiled for fixed and simple supports. In reality the foundation may not be completely sealed, calling for discretion in selecting the actual moment. The ability of the refrozen ice sheet to support extra load is explained by the fact that the water has been sealed between the surface and main sheet of ice and the volume occupied by the water cannot change. (Author)

AD-437 284 Div. 13
OTS price $11.50

Systems Analysis and Research Corp., Boston, Mass.
BENEFIT COST ANALYSIS OF AIRPORT SNOW, ICE, AND SLUSH REMOVAL.
Final rept.,
by John W. Drake and Robert L. Schein. Mar 64, 158p. Rept. no. RD64 28
Contract FA WA4685, Proj. 415 2S
Unclassified report

Descriptors: (*Snow removal, Airports), (*Airports, Snow removal), (*Costs, Snow removal), Tables, Aircraft landings, Aviation accidents, Ice, Time, Air traffic, Personnel, Earth handling equipment, Analysis of variance.

This analysis deals with the economic impact of snow, ice, and slush removal operations at eight U.S. airports including: Buffalo, New York; Chicago - O'Hare International Airport, Chicago; Cleveland - Hopkins Airport, Cleveland; Stapleton Field, Denver; Wold-Chamberlain Airport, Minneapolis; John F. Kennedy International Airport, New York; Greater Pittsburg Airport, Pittsburg; National Airport, Washington, D. C. The research approach included the conducting of both on-site interviews and operational simulation. Estimates were made of the costs incurred by both airport operators and users as a result of clearing operations during the winter of 1962-1963 and as forecast for a future time period around 1975. The total dollar penalty to airport users was found to be approximately five to six times that imposed on the airports themselves. It was further found that significant reduction in these costs could be effected by increasing the removal capacity and/or increasing the tolerable limits of snow and/or slush accumulation. (Author)

14. MATERIALS (NON-METALLIC)

AD-435 121 Div. 14
OTS price $1.60

Southern Research Inst., Birmingham, Ala.
THE DETERMINATION OF DESIGN CRITERIA FOR GRADE CFZ GRAPHITE.
Progress rept. no. 2, 1 Oct-31 Dec 63.
31 Dec 63, 19p. Rept. no. 6599 1534 VI
Contract AF33 657 11298
Unclassified report

Descriptors: (*Graphite, Physical properties), Radiography, Density, Compressive properties, Specific heat, Thermal conductivity, Permeability, Shear stresses.

The specimen configurations were verified by Research and Technology Division and the large CFZ graphite block was cut into slabs which were sent to Ohio State University for radiographic examination. The slabs were returned to Southern Research Institute on January 7, 1964 and the preparation of specimens began. Partial shipments of specimen for radiographic examination at Ohio State University will begin next month. (Author)

AD-435 479 Div. 14, 4
OTS price $.50

Naval Research Lab., Washington, D. C.
FILAMENT-WINDING PLASTICS. PART I. MOLECULAR STRUCTURE AND TENSILE PROPERTIES.
Interim rept.
by J. R. Griffith and F. S. Whisenhunt, Jr.
16 Mar 64, 5p.
Proj. SPO WW041
NRL 6047 Unclassified report

Descriptors: (*Filament-wound construction, Rocket cases), (*Plastics, Aging (Materials)), Epoxy plastics, Phenols, Ethers, Aromatic compounds, Amines, Tensile properties, Strain (Mechanics), Stresses, Additives.

When the diglycidyl ether of bisphenol-A reacts with m-phenylene diamine, the resulting plastic strongly binds glass filaments, and good quality filament-wound objects may be produced from these materials. Two additional plastics which are suitable for this application have been produced from curing agents which are molecularly similar to m-phenylene diamine. One of these curing agents, m-aminobenzylamine, has one aliphatic amino group, and the other, m-xylylene diamine, has two aliphatic amino groups. Tensile and elongation properties are compared for the plastics produced from these amines and the diglycidyl ether of disphenol-A. The plastic produced from m-aminobenzylamine has outstanding properties and pressure vessels produced using it are believed to be superior to those containing m-phenylene diamine. (Author)

AD-435 610 Div. 14, 25
OTS price $1.60

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
VIBRATION OF SPHERE FOR DETERMINING THE DILATATIONAL CONSTANTS OF VISCO-ELASTIC MATERIALS,
by Tung-Ming Lee. Feb 64, 13p.
Proj. 5010 21206
CRREL RR132 Unclassified report

Descriptors: (*Viscoelasticity, Materials), (*Fluid mechanics, Dynamics), Strain (Mechanics), Stresses, Equations, Wave transmission, Propagation, Mathematical analysis, Wave functions.

The forced vibration probjlem of a finite sphere with an exciting source embedded inside it was treated. The source is assumed to oscillate sinusoidally and the complex dilatational modulus is used to describe the motion inside the sphere. If the outer surface of the sphere is restrained from radial displacement, the ratio of the amplitude of a mid-point to the amplitude of a point on the exciting source could be used as an indication of the dilatational properties of the sphere. From the criterion of maximum amplitude ratio in conjunction with the frequency, the dilatational properties of a testing material can be determined. This method can be applied to visco-elastic fluids as well as solids. (Author)

AD-435 612 Div. 14
OTS price $1.25

Naval Research Lab., Washington, D.C.
A NEW VAPOR-SECURING AGENT FOR FLAMMABLE-LIQUID FIRE EXTINGUISHMENT,
by R. L. Tuve, H. B. Peterson, E. J. Jablonski and R. R. Neill. 13 Mar 64, 45p.
NRL 6057 Unclassified report

Descriptors: (*Fire extinguishers, Surface active substances), Surface properties, Films, Foams, Bicarbonates, Potassium compounds, Halogenated hydrocarbons, Fluorine compounds.

A study and testing program have resulted in the development of new water-soluble surfactants of the perfluorocarbon type capable of forming vapor-securing foams and films on the surface of low-flashpoint flammable fuels of the gasoline type. Equipment has been designed and developed for successful one-man application of these foams immediately following flame extinction with the free-radical quenching agent, potassium bicarbonate dry chemical, on a pound-for-pound basis. Problems of foam collapse, usually encountered where dry chemicals and vapor-securing foam agents are used together, are nonexsistent with the new perfluorocarbon foam surfactant. (Author)

AD-435 679 Div. 14
OTS price $1.25

National Carbon Co., Parma, Ohio.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. VOLUME XVIII - HIGH TEMPERATURE TENSILE CREEP OF GRAPHITE,
by E. J. Seldin. Mar 64, 44p.
Contract AF33 616 6915, Projs. 7350; 7391, Tasks 735002 and 738102
WADD TR61 72, vol. 18 Unclassified report

Report on Refractory Inorganic non-metallic materials.

Descriptors: (*Graphite, Creep), (*High temperature research, Graphite), Tensile properties, Heat of activation, Stresses, Temperative, Anisotropy, Strain (Mechanics), Analysis.

Tensile creep tests under conditions of constant load and constant temperature were performed on four different types of graphite. The temperature ranged from 2300 to 2900 C. Some of the data were fitted to creep equations and the temperature and stress dependence of the steady-state creep rates were investigated. For National Carbon Company grade ATJ graphite, the creep rates yielded an activation energy of 124 Kcal/mole and varied with the fourth power of the stress for specimens with two different grain orientations. The activation energy was found to the same for all the other graphites which were tested. The creep was found to be greater in the direction against the grain than

in the direction with the grain, and differences in creep strain and creep rate for the two orientations were found to increase as the anisotropy of the graphite was increased. For one type of graphite, the creep of specimens oriented ''with the grain'' decreased as the density increased and was not sensitive to differences in the proportions of filler and binder carbon. (Author)

AD-435 809 Div. 14, 17
OTS price $6.60

Defense Metals Information Center, Columbus, Ohio.
DEFENSE METALS INFORMATION CENTER SELECTED ACCESSIONS,
comp by Mary L. Banks. Mar 64, 62p.
Contract AF33 615 1121, Proj. 8975
Unclassified report

Descriptors: (*Materials, Abstracts), (*Abstracts, Materials), Alloys, Metals, Graphite, Refractory materials, Ceramic materials, Composite materials, Coatings, Mechanical properties, Physical properties, Material forming.

AD-435 814 Div. 14, 4, 26, 30
OTS price $1.00

Carbon Products Div., Union Carbide Corp., Lawrenceburg, Tenn.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. VOLUME XII. DEVELOPMENT OF AN IMPROVED LARGE DIAMETER FINE GRAIN GRAPHITE FOR AEROSPACE APPLICATIONS.
Rept. for May 60-Aug 62,
by C. W. Waters and E. L. Piper. Mar 64, 39p.
Contract AF33 616 6915, Projs. 7350, 7381, Tasks 735002, 738102
WADD TR61 72, vol. 12 Unclassified report

Report on Refractory Inorganic Non-Metallic Materials, Materials Application and Process Development for Graphite Materials.

Descriptors: (*Graphite, Research program administration), Manufacturing methods, Processing, Production, Pressure, History, Heat treatment, Binders, Sulfur, Polymerization, Plastuzers, Molding, Particle size, Electrical properties, Structural properties, Physical properties, Mechanical properties, Impregnation, Porous materials, Feasibility studies, Thermosetting plastics.

This report describes a method for producing graphite using a pressure curing process which was partially developed prior to initiation of this contract. The process is based on a thermosetting binder system and is employed to develop a reasonable uniform fine-grain graphite. Also presented are the contract supported investigations of the process variables associated with attempting to reach optimum properties and with scaling up to 30-inch diameter sizes. This graphite, designated Grade RVA, is nominally characterized by a bulk density of 1.85 g/cc, room temperature with and against grain flexural strengths of 3700 and 2900 psi respectively, with and against grain elastic moduli of 1.7 and 1.3 million psi respectively, and variations in these properties of only one-half to one-third of those normally associated with quality industrial graphites such as grade ATJ. (Author)

AD-436 003 Div. 14, 17, 26
OTS price $2.50

Pfaudler Co., Rochester, N. Y.
DEVELOPMENT OF A CEMENTATION COATING PROCESS FOR HIGH-TEMPERATURE PROTECTION OF MOLYBDENUM.
Rept. for 1 Apr 60-28 Feb 61,
by P. J. Chao, B. S. Payne, Jr. and D. K. Priest.
Mar 64, 101p. Rept. no. PF61 9
Contract AF33 616 7192, Proj. 7381, Task 73811
ML TDR64 55 Unclassified report

Report on Materials Application.

Descriptors: (*Molybdenum alloys, Protective treatments), (*Refractory coatings, Manufacturing methods), Reentry vehicles, Oxidation, High-temperature research, Diffusion, Coatings, Silicides, Analysis of variance, Niobium compounds, Molybdenum compounds, Tantalum compounds, Tungsten compounds, Vanadium compounds, Effectiveness, Titanium alloys, Metallography.

A pack cementation coating process was successfully developed to protect molybdenum alloy entry vehicle components against oxidation at temperatures near 3000 F. Designated PFR-6, the 2 to 3 mil diffusion coating is a silicide prepared from a siliconizing pack containing small amounts of columbium powder. It was evaluated statistically in an analysis of variance study to demonstrate an average lifetime of 1.36 hr in an oxyacetylene torch at a temperature exceeding 3000 F. The 95% confidence limit is 0.81 to 1.91 hr at the same temperature. Three major process concepts were studied: single-cycle codeposition, multicycle codeposition, and multicycle alternate layer coatings. Using these processes 41 types of coatings were made and screened initially, from which 5 were selected for further evaluation. An intensive study of processing and testing variables empolying a formal statistical approach resulted in the choice of the single-cycle PFR-6 coating for process optimization. Pack composition, process time, and process temperature were optimized. (Author)

AD-436 017 Div. 14, 17
OTS price $1.60

General Dynamics/Fort Worth, Tex.
ENGINEERING RESEARCH - SEALANTS - COMPOSITE FIBER-METAL O-RING - EVALUATION OF,
by M. T. Carroll and D. J. Pritchard. 15 Apr 64, 16p. Rept. no. ERR FW174
Contract AF33 657 11214
Unclassified report

Descriptors: (*Composite materials, Seals (Stoppers)), (*Fuel seals, Composite materials), (*O-rings, Fuel seals), Metallic textiles, Fibers, Impregnation, Silver, Molybdenum, Metal seals, Low temperature research, High temperature research, Performance (Engineering)

A silver-impregnated composite molybdenum fiber-metal O-ring seal was tested as a fuel seal in the temperature range of -100 to +1200 F. The dimensions of the seal were 6-1/2 in. outside diameter by 6-1/8 in. inside diameter by 3/16 in. cross-section diameter. Sealing properties at room temperature were determined by placing the seal between the faying surfaces of a steel test tank and applying internal air pressure. Sealing forces were applied with a hydraulic operated press. (Author)

AD-436 018 Div. 14
OTS price $1.60

General Dynamics/Fort Worth, Tex.
DENSIFICATION OF AN OXIDE POWDER MIXTURE,
by R. D. Potter. 15 Jan 64, 15p. Rept. no. ERR FW212
Contract AF33 657 11214
Unclassified report

Descriptors: (*Oxides, Material forming), (*Powders, Oxides), Explosive forming, Dies, High pressure research, Iron compounds, Lithium compounds, Nickel compounds, Zinc compounds, Density.

An oxide powder mixture containing iron, lithium, nickel and zinc was studied as to densification techniques by dynamic and static pressure means. Densification by impact has been unsuccessful in a 150 ft. per sec. - 500 gram impact device but a good increase in density has been obtained by compacting and pressing to 100 kilobars pressure in the UniRam tetrahedral device. (Author)

AD-436 019 Div. 14, 1
OTS price $5.60

General Dynamics/Fort Worth, Tex.
STIFFNESS CHARACTERISTICS OF SANDWICH TYPE FLUTTER MODEL CONSTRUCTION,
by A. C. Murphy. 15 Apr 64, 54p. Rept. no. ERR FW167
Contract AF33 657 11214
Unclassified report

Descriptors: (*Sandwich construction, Structural properties), (*Aerodynamic configurations, flutter), Cantilever beams, Deflection, Loading (Mechanics), Honeycomb cores, Wood, Expanded plastics, Bonded joints, Bonding.

The structural stiffness of sandwich type construction was investigated in order to develop design and construction techniques which will ensure consistent and predictable stiffness characteristics in flutter models utilizing sandwich construction. Specimens which used various fabrication techniques and materials were tested and analyzed to determine the predictability of the stiffness. It was concluded that flutter models can be designed using equivalent type sandwich construction and that they will have predictable characteristics provided care and control are exercised in the construction. (Author)

AD-436 109 Div. 14, 8, 26
OTS price $8.10

National Cash Register Co., Dayton, Ohio.
RESEARCH AND INVESTIGATION OF CATHODOLUMINESCENT PHOSPHOR FILMS PREPARED BY SOLUTION SPRAYING.
Rept. for 1 June 62-31 Aug 63,
by M. S. Hall, J. W. Gilliland, Jr. and E. Reinmuller. Mar 64, 82p.
Contract AF33 657 8985, Proj. 4156, Task 415605
AL TDR64 15 Unclassified report

Descriptors: (*Phosphorescent materials, Films), (*Cathode ray tube screens, Materials), (*Films, Preparation), Cadmium compounds, Tungstates, Solutions, Zinc compounds, Silicates, Sulfides, Coatings, Sprays, Glass, Quartz, Heat treatment, Stainless steel, Adhesion, X-ray diffraction analysis, Impurities, Samarium, Cerium, Manganese, Silver, Luminescence, Crystal structure, Metal coatings, Aluminum coatings, Emissivity, Ceramic materials, Complex compounds.

Effort was made to determine the capabilities and necessary compromises in preparing cathodoluminescent films by a chemical solution spray process. This spray process is capable of forming cathodoluminescent films in situ on substrates which can withstand a spray temperature of 300 C and a heat treatment temperature of 600 C. Desired dopants may be incorporated by adding them to the spray solution. The cathodoluminescent film compositions investigated were: $CdWO_4$, $CdWO_4$:Sm, $CdWO_4$:Ce, $ZnWO_4$, Zn_2SiO_4:Mn, CdS:Ag, ZnS:Ag, and ZnCdS:Ag. Properties of these films were evaluated by x-ray diffraction analysis, by photo- and cathodoluminescent brightness and spectral emission, and by thermoluminescent glow-curve studies. (Author)

AD-436 252 Div. 14
OTS price $.75

Army Materials Research Agency, Wtertown, Mass.
INFRARED RADIATION OF SOLIDS - REFRACTORY MATERIALS,
by Albert F. Grenis and Albert P. Levitt.
Feb 64, 26p.
DA Proj. 1A010501B010
AMRA TR64 03 Unclassified report

Report on Basic Research in Physical Sciences.

Descriptors: (*Refractory materials, Infrared radiation), (*Ceramic coatings, Infrared radiation), Oxides, Aluminum compounds, Chromium compounds, Zirconium compounds, Nitrides, Boron compounds, Emissivity, High-temperature research, Solids, Blackbody radiation.

Appartus and techniques were developed for determining the infrared radiation characteristics of solids, including flame-sprayed ceramic coatings, at elevated temperatures. The theoretical basis for the equipment design and operation is discussed. The normal spectral emittance, integrated normal total emittance, and infrared radiation intensity curves of selected solids for different surface conditions were determined at a temperature of 1300 K in the wavelength region extending from 1.0 to 10.0 microns. Infrared radiation properties for the three flame sprayed ceramic coatings, aluminum oxide, chromic oxide, and zirconium oxide, and for one test specimen of solid boron nitride are discussed. It was found that flame-sprayed chromic oxide most closely simulated a blackbody in the wavelength region studied. (Author)

AD-436 266 Div. 14, 12
OTS price $4.60

General Dynamics, Forth Worth, Tex.
A RADIATIVE INSULATION SYSTEM FOR STRUCTURAL PROTECTION IN A RE-ENTRY ENVIRONMENT,
by A. D. Mayfield, M. H. Kite and C. F. Herndon.
15 Apr 64, 45p. Rept. no. ERR FW120
Contract AF33 657 11214
Unclassified report

Descriptors: (*Thermal insulation, Space environmental conditions), (*Reentry vehicles, Thermal insulation), Thermal radiation, Absorption, Ablation, Heat transfer, Bibliographies, Spacecraft, Models (Simulation), Heat-resistant materials, Ceramic materials, Quartz, Nickel alloys, Chromium alloys, Molybdenum alloys, Iron alloys, Mechanical properties, Heat-resistant metals and alloys, Hypersonic flight, High-temperature research, Manufacturing methods, Physical properties, Manned spacecraft, Structures.

This report presents a survey of the various techniques for providing thermal protection. The fundamental principles of heat transfer are reviewed and the general requirements of a thermal protection system are examined. The various components of the proposed design are discussed in detail. The report also includes transient response data which were analytically obtained by analog simulation, and an annotated bibliography. (Author)

AD-436 267 Div. 14, 12
OTS price $1.60

General Dynamics, Fort Worth, Tex.
RESEARCH ON PHENYL SILANE HIGH TEMPERATURE

LAMINATING RESINS,
by J. W. Head. 31 Dec 61, 19p. Rept. no. ERR FW126
Contract AF33 657 11214
Unclassified report

Descriptors: (*Heat-resistant plastics, Laminated plastics), (*Phenolic resins, Laminated plastics), (*Glass textiles, Laminated plastics), (*Laminated plastics, Glass textiles), Silanes, Spacecraft, Manufacturing methods, High-pressure research, Presses (Machinery), Silicone plastics, Polymers, Inorganic polymers.

This program on phenyl silane preimpregnated glass fabric laminates was initiated in order to increase technical proficiency in the field of new high temperature structural plastics. Several manufacturers had reported that laminates made from phenyl silane resin showed good properties to temperatures of 700 F, but that the material was difficult to laminate and was very sensitive to time-temperature-pressure cycles. The reported handling difficulties were confirmed in our laboratory. After considerable experimenting however, a satisfactory lay up procedure was developed using a bonding blanket technique. No testing of specimens for structural properties was conducted during this research period. (Author)

AD-436 294 Div. 14, 17
OTS price $12.00

Westinghouse Electric Corp., Lima, Ohio.
ALKALI METAL RESISTANT WIRE,
by E. S. Bober, R. E. Stapleton and W. H. Snavely. 15 Apr 64, 163p.
Contract AF33 657 10701, Proj. 8128, Task 812806
APL TDR64 42 Unclassified report

Report on Development of High Temperature Alkali Metal Resistant Insulated Wire.

Descriptors: (*Electric wire, Alkali metals), (*Electric insulation, Ceramic coatings), (*Wire, Silver), High-temperature research, Vapors, Potassium, Aluminum compounds, Nickel compounds, Zirconium compounds, Oxides, Vapor plating, Adhesion, Radiation damage, Gamma rays, Thermal radiation, Strontium compounds, Zirconates, Nickel, Metal coatings, Mercury, Nitrides, Boron compounds, Vibration, Shock resistance, Copper, Metal seals, Tungsten.

A ceramic coated conductor system was developed that was unaffected by 172 hours exposure to K (potassium) vapor at 850 C. This system was Metco 201 Zirconia, plasma sprayed on nickel aluminide coated Nickel clad Silver AWG 8 (Sylvania) wire. This system, however, is not suitable for electrical operation at 850 C since the resistance of the zirconia coating drops to about 5 ohms at 600 C. Overcoating the zirconia with aluminum nitride by a vapor plating technique results in a resistance at 850 C in argon for the multicoat of 1.8 x 10 to the 4th power ohms. The aluminum nitride overcoated zirconia is unaffected by 172 hours exposure. A number of high purity insulators were found to be resistant to potassium vapor at 850 C. These were alumina, magnesia, and strontium zirconate. a primary problem with plasma spray coatings of these materials is loss of adhesion in the potassium vapor even when a nickel aluminide undercoat is used. (Author)

AD-436 324 Div. 14
OTS price $1.10

New York State Coll. of Ceramics, Alfred U.

THE STRESS-STRAIN BEHAVIOR OF STRONTIUM ZIRCONATE.
Bimonthly progress rept. no. 3, 15 Jan-15 Mar 64, by J. E. Funk, J. Nemeth and J. R. Tinklepaugh. 15 Mar 64, 5p.
Contract NOw64 0051d
Unclassified report

Descriptors: (*Strontium compounds, Zirconates), (*Zirconates, Mechanical properties), Crystal structure, Crystal growth, Single crystals, Sintering, Density, Recrystallization, Synthesis (Chemistry).

Success was achieved in sintering C.P. SrZr03. Mechanical grinding was apparently necessary to facilitate sintering and the impurity pickup is low enough not to be detectable. Small single crystals have been grown from a salt flux by seeding with a few small grains of SrZr03. (Author)

AD-436 434 Div. 14, 10, 26
OTS price $4.60

Defense Fuel Supply Center, Washington, D. C.
REFERENCE LIST OF SPECIFICATIONS AND STANDARDS FOR PETROLEUM AND RELATED PRODUCTS.
Mar 64, 45p.
DFSC Bull. 4140 1 Unclassified report

Descriptors: (*Petroleum, Specifications), (*Fuels, Standards), Packing materials, Paints, Military requirements.

AD-436 693 Div. 14, 22
OTS price $1.60

General Tire and Rubber Co., Marion, Ind.
(No title).
Final progress rept.
20 Apr 64, 13p.
Contract DA33 008AMC59W
Unclassified report

Report on Phase 1.

Descriptors: (*Gun components, Plastics), (*Molding materials, Plastics), (*Epoxy plastics, Molding materials), (*Polyester plastics, Molding materials), Reinforcing materials, Glass, Tensile properties, Impact shock, Phenolic plastics, Mechanical properties, Physical properties.

A material investigation to develop a glass reinforcing molding compounds for M-14 rifle stock application was conducted. The report is presented in two segments. The first segment discusses the investigation of various epoxy and polyester resin systems for premix molding compounds. The second segment indicates the study of various commercially available molding compounds. Each segment is broken down into the various materials studied for ease of comparison of formulations investigated. (Author)

AD-436 701 Div. 14
OTS price $2.60

General Dynamics/Fort Worth, Tex.
MATERIALS - LUBRICATING OIL - GTO-915 - IRRADIATION UNDER STATIC AND DYNAMIC CONDITIONS - EFFECTS OF -,
by R. H. McDaniel. 15 Apr 64, 25p. Rept. no. FGT2767
Contract AF33 600 38946
Unclassified report

Descriptors: (*Jet engines, Lubricants), (*Lubricants, Radiation damage), Degradation, Performance (Engineering), Stability, Heat, Oxidation, Lubrication, Effectiveness, Viscosity, Shear stresses.

A dynamic pump loop system, designed and constructed at this facility, was operated for 20 hours in a non-nuclear environment to establish base line data on the functional fluid which was a high temperature jet engine lubricating oil. The system was then subjected to operation in a nuclear environment. Dynamic and static oil samples were taken periodically during both runs to determine physical and chemical property changes of the test fluids. Average bulk oil temperature within the static and dynamic reservoirs was 300 F. System operation and fluid characteristics, with the exception of increased coking tendency at 700 F, were satisfactory during the pre-irradiation run. System operation was also satisfactory during the 23 hours irradiation run. However, changes were noted in all measured properties of the irradiated fluids. (Author)

AD-436 733 Div. 14, 12
OTS price $8.60

General Dynamics/Fort Worth, Tex.
TEST REPORT--CENTAUR LIGHTWEIGHT INSULATION PANELS, DESIGN ALLOWABLES, PHASE II,
by G. H. Hayward, W. M. Beatty and R. E. Bryant. 26 Aug 63, 93p. Rept. no. SSR1 63
Unclassified report

Descriptors: (*Launch vehicles, Rocket motors (Liquid propellant)), (*Airframes, Performance (Engineering)), (*Honeycomb cores, Sandwich construction), Laminated plastics, Reinforcing materials, Glass, Phenolic plastics, Epoxy plastics, Stresses, Design, Aging (Materials) Cryogenics, Heat,

The purpose of this test program is to determine the strength of the sandwich composite and its components in order to establish design allowable stresses. These tests were performed to determine the mechanical properties of the insulation panel composite and its component parts through the temperature range of -423 through +550 F. (Author)

AD-436 734 Div. 14, 12, 25
OTS price $3.60

General Dynamics/Fort Worth, Tex.
TEST REPORT--CENTAUR LIGHTWEIGHT INSULATION PANELS, COMPONENT TESTS, PHASE III,
by R. W. Soady. 2 Mar 64, 32p. Rept. no. MR SS 014
Unclassified report

Descriptors: (*Launch vehicles, Panels (Structural)), (*Thermal insulation, Stresses), Loading (Mechanics), Rocket motors (Liquid propellant), Deflection, Design, Test methods, Tests, Structures, Analysis, Failure (Mechanics).

Component tests were performed on each configuration of the Centaur Lightweight Insulation Panels. Each panel was loaded in hoop tension with the exception of the hinge panel. All of these tests were conducted at room temperature. The results of the room temperature tests confirm the design and analysis for those components that are critical at room temperature. (Author)

AD-436 833 Div. 14
OTS price $4.00

Office of Technical Services, Dept. of Commerce, Washington, D. C.
FOAMED PLASTICS. PROCEEDINGS OF A CONFERENCE. STATLER-HILTON HOTEL, BOSTON, MASSACHUSETTS, APRIL 22-23, 1963,
ed. by Frank R. Fisher. 1963, 272p.
Unclassified report

Descriptors: (*Expanded plastics, Symposia), (*Symposia, Expanded plastics), Isocyanate plastics, Materials, Military requirements, Thermal insulation, Processing, Molding materials, Electric insulation, Packaging.

AD-436 856 Div. 14
OTS price $5.60

Aerojet-General Corp., Sacramento, Calif.
DEVELOPMENT OF IMPROVED RESIN SYSTEMS FOR FILAMENT-WOUND STRUCTURES.
Bimonthly progress rept. no. 5, 11 Jan-10 Mar 64,
by J. J. Cooney. 12 Apr 64, 51p. Rept. no. 0627VI5
Contract NOW63 0627c FBM
Unclassified report

Descriptors: (*Filament wound construction, Plastics), Additives, Hardening, Weight, Epoxides, Plasticizers, Mechanical properties, Tests, Transition temperature, Deformation, Temperature, Density, Ethylwnwsiamino, Amines, Performance (Engineering), Processing, Winding, Polymerization, Statistical analysis, Anhydrides, Phthalic acids, Amino plastics, Succinic anhydrides, Sebacic acid, Aging (Materials).

This fifth bimonthly progress report presents results of statistical analyses of property data obtained for resin systems cured with ethylenediamine, hexamethylenediamine, and hexahydrophtalic anhydride, together with the analyses of data not previously reported for tests conducted on 4,4'-methylene-diamine-cured systems. The results of property tests for systems cured with succinic anhydride, and polysebacic anhydride are also reported. (Author)

AD-436 873 Div. 14
OTS price $8.60

Narmco Industries, Inc., San Diego, Calif.
DETERMINATION OF THE PERFORMANCE OF PLASTIC LAMINATES AT CRYOGENIC TEMPERATURES.
Rept. for 15 Nov 62-15 Feb 64,
by Don W. Chamberlain, B. R. Lloyd and R. L. Tennent. Mar 64, 96p.
Contract AF33 616 8289, Proj. 7381, Task 738103
ASD TDR62 794, pt. 2 Unclassified report

Descriptors: (*Laminated plastics, Low-temperature research), (*Glass textiles, Low-temperature research), (*Low-temperature research, Laminated plastics), Epoxy plastics, Polyester plastics, Nylon, Isocyanate plastics, Halocarbon plastics, Silanes, Reinforcing materials, Cryogenics, Tensile properties, Compressive properties, Elasticity, Fatigue (Mechanics), Mechanical properties, Test equipment, Tables, Nomographs.

This program is a continuation of the effort begun under this contract for the determination of mechanical properties of various plastic laminate materials at cryogenic temperatures. The program was extended to include additional resin systems, some of which were developed specifically for cryogenic applications. Also investigated were reinforcement materials including stainless steel, nylon, and Fortisan. Mechanical properties data included tensile, compressive and flexural strength, and modulus of elasticity, as well as bearing strength and tensile fatigue

values. Test temperatures used were room temperature, -110, -320, and -423 F. Several glass reinforced plastic laminate materials appeared most promising as structural materials in cryogenic environments. (Author)

AD-437 107 Div. 14, 12
OTS price $3.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
EXPANDABLE SPACE STRUCTURE MATERIAL RESEARCH,
by M. Moss and L. M. Roseland. 14 Jan 64, 34p.
Rept. no. SM44641
Unclassified report

Descriptors: (*Fibers (Synthetic), Inflatable structures), (*Inflatable structures, Fibers (Synthetic)), (*Polyester plastics, Inflatable structures), (*Polyamide plastics, Inflatable structures), Filaments, Heat-resistant plastics, Radiation damage, Tensile properties, Mechanical properties, Stresses, Nomographs, Spacecraft.

The experimental stress-strain behavior of two organic fibers, HT-1, an aromatic polyamide, and Dacron, a polyester, and various yarns composed of these fibers is presented. The tensile properties of each fiber in a particular yarn and fabric form are compared. (Author)

AD-437 111 Div. 14
OTS price $2.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
ADHESIVES AND RESINS FOR MISSILE APPLICATION,
by L. M. Roseland. 25 Feb 63, 26p. Rept. no. SM44660
Unclassified report

Descriptors: (*Heat-resistant materials, Adhesives), 8benzimidazoles, Polymers), (*Adhesives, Heat-resistant materials), (*Composite materials, Laminated plastics), Shear stresses, Tensile properties, Deformation, Spacecraft, Guided missiles, Halocarbon plastics, Processing, Glass textiles, Polyamide plastics, Plastics.

This study presents the mechanical strengths of new heat resistant polymeric materials. These include polyimide resins and polybenzimidazole resins. Results include overlap shear strengths, laminate tensile strengths, and laminate flexural strengths. (Author)

AD-437 122 Div. 14
OTS price $2.60

NARMCO Industries, Inc., San Diego, Calif.
INTERLAMINAR SHEAR OF FILAMENT-WOUND REINFORCED PLASTICS.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 64, by Robert A. Elkin, Boris Levenetz and Bud L. Duft. Apr 64, 28p.
Contract N60921 7094
Unclassified report

Descriptors: (*Filament wound construction, Plastics), Reinforcing materials, Glass textiles), (*Plastics, Filament wound construction), Material forming, Epoxy plastics, Phenolic plastic, Shear stresses, Amino plastics, Compressive properties, Elasticity.

Fabrication and testing of the NOL-type ring specimens were completed. The largest variations in shear strength occurred between the different resin systems. One of the newer epoxy resins chosen for study exhibited interlaminar shear strength of over 15,000 psi. Of particular interest, also, was the effect of winding geometry on shear strength. By winding fibers in the third planar direction, the apparent interlaminar shear stregth of the specimens was increased by approximately 30%. (Author)

AD-437 124 Div. 14
OTS price $11.50

Owens-Corning Fiberglas Corp., Toledo, Ohio.
GLASS REINFORCEMENTS FOR FILAMENT WOUND COMPOSITES.
Final technical engineering rept. Aug 62-Dec 63, by Edwin M. Lindsay and James C. Hood. Dec 63, 160p.
Contract AF33 657 9623, Proj. 8 104
RTD TR64 8 104 Unclassified report

Descriptors: (*Filament wound construction, Composite materials), (*Reinforcing materials, Glass textiles), (*Glass textiles, Manufacturing methods), Fibers, Tensile properties, Glass, Cordage, Processing, Test methods, Theory, Cylindrical bodies, Hydrostatic pressure, Mandrels, Tables, Experimental data.

An investigation of the process for manufacturing glass fiber reinforcements for filament winding plastic composite structures was completed. The data indicate that the difference between average virgin fiber strength and roving strength is 20%. Experiments were run on every step in the process from the bushing through roving, and material was tested at intermediate points. The results show that the differenc between average virgin fiber strength and roving strength in a composite cannot be attributed to any specific process operation. If there is actually a loss in fiber strength from virgin fiber to roving, presently available test methods are unable to measure it. A theory which predicts the strength of a bundle of fibers of varying strengths was proposed by several investigators. Application of this theory to single fiber data predicts that a 20% reduction from average single fiber tensile strength can be expected in glass fiber roving. (Author)

AD-437 134 Div. 14
OTS price $3.60

Nortronics Div., Northrop Corp., Needham Heights, Mass.
RADIOMETRIC DATA GATHERING PROGRAM.
Final rept.
Apr 64, 35p. Rept. no. MED64 130
Contract AF19 628 2749, Proj. 4600, Task 460007
AFCRL 64 170 Unclassified report

Descriptors: (*Materials, Electromagnetic properties), (*Electromagnetic waves, Absorption), (*Reflection, Electromagnetic waves), Asphalt, Concrete, Sand, Wood, Water, Snow, Metallic textiles, Radiometers, L band, Measurement, Temperature.

The report gives the results of an L-Band (1420 mc) measurement program which was undertaken to establish the radiometric temperature of certain materials as a function of incidence angle, polarization, and environmental conditions. The materials tested were wood, asphalt, concrete, and sand. The results indicate that the values of radiometric temperature are a decreasing function of incidence angle as measured from the nadir for the sense of polarization with the E-vector horizontal. The values for concrete range from about 171 K at 20 degrees from the nadir to 50 K at 70 degrees from the nadir, and the values for asphalt are 201 K to 45 K at the same points. Wood and sand lie in between these two values. The values obtained for other materials lie quite close to those of concrete at the low values of nadir angles, but diverge widely at the 70 degree

nadir angle. Water on the surface of the materials has the effect of reducing the apparent temperature of the material, and snow has the effect of raising the apparent temperature. (Author)

AD-437 144 Div. 14
OTS price $3.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
MECHANICAL PROPERTIES OF PYROLYTIC GRAPHITE,
by J. J. Gebhardt and J. M. Berry. Apr 64, 37p. Rept. no. R64SD26
Unclassified report

Descriptors: (*Pyrolytic graphite, Mechanical properties), Tensile properties, Elasticity, Strain (Mechanics), Strain gages, Nucleation, Microstructure, Heat, Thermal expansion.

A series of mechanical strength and thermal expansion tests was carried out from room temperature to 5000 F on the two microstructural types of current production pyrolytic graphite. Results indicate that with appropriate precautions in selecting test material, machining and testing specimens, current production pyrolytic graphites yield higher, more reliable mechanical property values. The contribution of process improvements to this increase cannot be specifically separated although it may show up principally in allowing more of a given batch of material to be selected. The present series of tests shows pyrolytic graphite to have an ultimate 'a' direction tensile strength of 18,000 ± 2,000 psi at room temperature rather than previously found values of 11,000 ± 5,000 psi. The largest difference between surface nucleated and continously nucleated material was obtained in torsional tests parallel to the planes; values of 1555 ± 60 and 2880 ± 265 psi were obtained respectively throughout the temperature range to 5000 F. (Author)

AD-437 170 Div. 14, 25
OTS price $1.60

Naval Ordance Lab., White Oak, Md.
CHEMICAL AND PHYSICAL EFFECTS OF GLASS SURFACES UPON LAMINATING RESINS,
by P. W. Erickson, Angelo Volpe and E. Ruth Cooper. Apr 64, 20p.
NOL TR63 267 Unclassified report

Descriptors: (*Laminated plastics, Theory), (*Glass textiles, Laminated plastics), (*Finishes and finishing, Laminated plastics), Epoxy plastics, Adsorption, Glass, Surfaces, Fibers (Synthetic), Deformation, Creep, Additives, Aging (Materials), Mechanical properties, Films, Spectra (Infrared), Amines.

A new theory is discussed to explain another possible function of a finish at the resin-glass interface in a reinforced plastic. Glass surfaces with and without finishes display chromatographic properties. The data indicate that forces or factors at the interface lead to changes in the liquid resin-hardener ratio. Results are interpreted as evidence for the existence of a flexible resin layer at the interface, which operates to reduce local interlaminar stresses. Different glass fiber finishes postulated to lead to different physical properties in this deformable resin layer, may have important effects on laminate strength properties. (Author)

AD-437 238 Div. 14
OTS price $3.60

General Dynamics/Fort Worth, Tex.
MATERIAL - LUBRICATING OIL - GTO-790 - IRRADIATION UNDER STATIC AND DYNAMIC CONDITIONS - EFFECTS OF,
by R. H. McDaniel. 7 July 60, 38p. Rept. no. FGT 2622
Contract AF33 600 38946
Unclassified report

Descriptors: (*Lubricants, Radiation damage), (*Radiation damage, Lubricants), (*Low-temperature lubricants, Radiation damage), Oils, Degradation, Gamma rays, Neutron beams, Viscosity, Flammability, High-temperature research, Low-temperature research.

A dynamic pump loop system, was operated for 50 hrs. in a non-nuclear environment to establish base line data on the functional fluid which was GTO-790. The system was then subjected to operation in a nuclear environment. Dynamic and static oil samples were taken periodically to determine physical and chemical property changes of the test fluids. Average bulk oil temperature was 285 F. The irradiation run was terminated after 19.5 hrs. because of decreasing flash point values. The effects of simultaneous dynamic operation and irradiation on GTO-790 fluid did not appear to be synergistic. (Author)

AD-437 243 Div. 14, 26
OTS price $11.50

Goodyear Aerospace Corp., Akron, Ohio.
HIGH-STRENGTH MATERIALS FOR EXPANDABLE STRUCTURES COMPILATION OF UNPUBLISHED DATA GENERATED BY GOODYEAR AIRCRAFT CORPORATION.
Quarterly rept. no. 1, 1 July-1 Oct 61,
by D. P. Fasnacht, Jr. 15 Oct 61, 153p. Rept. no. GER10446
Contract AF33 616 8473, Proj. 1 8 7381, Task 73812
Unclassified report

Descriptors: (*Elastomers, Coatings), (*Coatings, Textiles), (*Textiles, Coatings), Dacron, Nylon, Synthetic rubber, Tensile properties, Permeability, Hydrogen, Manufacturing methods, Cotton textiles, Inflatable structures.

Information is presented on the physical properties of a group of high-strength, expandable-structure materials, made of elastomer-coated cotton, nylon, and Dacron fabrics. Original test data are tabulated for each individual roll of coated fabric, and the construction specification of each is given. The test methods used are described in detail. Also, described is the process of manufacturing elastomer-coated fabrics. (Author)

AD-437 249 Div. 14
OTS price $4.60

General Dynamics, Fort Worth, Tex.
MATERIAL - ADHESIVES - STRUCTURAL - F-111 - SCREENING TESTS OF.
Test rept. 15 Mar-15 July 63,
by J. P. Thomas. 15 Apr 64, 48p. Rept. no. FGT 3048
Contract AF33 657 8260
Unclassified report

Descriptors: (*Adhesives, Structural parts), (*Structural parts, Adhesives), Bonding, Airplane panels, Epoxy plastics, Laminates, Sandwich construction, Salt spray tests, Creep, Humidity, Rupture, Heat, Deformation.

One metal-to-metal adhesive and six sandwich type adhesives were tested in accordance with selected screening tests under F-111 environmental conditions. The metal-to-metal adhesive performed

satisfactorily when tested in creep rupture and exposed to salt water spray and high humidity under simulated F-111 environment conditions. Four of the six sandwich type adhesives passed 270 and 350 F laminate-to-aluminum creep rupture. All sandwich adhesives tested performed satisfactorily in salt water spray and high humidity resistance. (Author)

AD-437 251 Div. 14
OTS price $2.60

General Dynamics, Fort Worth, Tex.
FLIGHT CONTROL SYSTEM: INVESTIGATION OF BEARING RETENTION BY USE OF ADHESIVE OR SEALANTS,
by I. K. Spiker. 15 Apr 64, 25p. Rept. no. FGT3082
Unclassified report

Descriptors: (*Flight control systems, Ball bearings), (*Ball bearings, Sealing compounds), Jet planes, Effectiveness, Vibration, Temperature, Moisture, Penetration, Jet engine fuels, Freezing point depressants, Glycols.

This report discusses the results of tests conducted on installation of bearings using sealants or adhesives. Tests were conducted to determine: the effect on beakaway torque; resistance to vibration under load; time and temperature properties under axial load; resistance to water, JP-4 fuel, and ethylene glycol; and the maximum thrust to remove bearings after each of the preceding tests. Methods of cleaning the bearing outer race were also studied. These various tests were conducted in close coordination with the Design Group. The use of Loctite sealants, grades ''A'' and ''B'' proved to be entirely feasible for bearing installations in steel housings, but are not adequate for use in aluminum housings. (Author)

AD-437 252 Div. 14, 1
OTS price $2.60

General Dynamics, Fort Worth, Tex.
MATERIAL - SEALANT, SYNTHETIC ELASTOMER - EVALUATION OF MODIFIED EC-1610 TYPE,
by J. M. Warren. 15 Apr 64, 21p. Rept. no. FGT3029
Contract AF33 600 41891
Unclassified report

Descriptors: (*Sealing compounds, Fuel tanks), (*Plastic seals, Fuel tanks), (*Fuel tanks, Sealing compounds), Jet engine fuels, Jet bombers, Sea water, Environmental tests, Mechanical properties, Adhesion, Elastomers.

Specimens of modified EC-160 and PR-9422 B1/2 were tested. Results indicated: (1) Both materials have approximately the same application time. The modified EC-1610 developed hardness considerably faster than PR-9422 B1/2. (2) Modified EC-1610 and PR-9422 B1/2 had about the same resistance to thermal rupture and thermal shock after soaking in jet reference fuel (JRF). Both sponged to some extent. (3) Comparison of thermal extrusion of the two sealants showed the modified EC-1610 to have less extrusion from small tubes than PR-9422 B1/2. (4) Both sealants showed comparable losses of adhesion to substrates after immersion in a 2-layer media, JRF-salt water, at 140 F. In resistance to JRF alone at 140 F, PR-9422 B1/2 appeared to have the advantage over modified EC-1610. (5) Both sealants showed good repairability. It was concluded that modified EC-1610 was the better structural void repair sealant. (Author)

AD-437 307 Div. 14
OTS price $.75

Air Force Materials Lab., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
HIGH TEMPERATURE FERROELECTRIC MATERIALS,
by R. W. Ohlwiler. Mar 64, 26p.
Proj. 7371, Task 737101
ML TDR64 24 Unclassified report

Report on Exploratory Development in Electrical, Electronic, and Magnetic Materials.

Descriptors: (*Ferroelectric crystals, Reviews), (*Ferroelectric materials, Reviews), Thermal properties, Heat-resistant materials, Lead compounds, Niobates, Lithium compounds, Tantalum compounds, Potassium compounds, Titanates, Sodium compounds, Oxygen compounds, Dielectric properties, Electrical properties, Single crystals, Rubidium compounds, Aluminum compounds, Vanadates, Zirconates, Bismuth compounds, Oxides, Ferrites, Hafnium compounds, Barium compounds, Piezoelectric effect, Bibliographies, Ferroelectricity.

This report reviews published data on high temperature ferroelectric materials. Applicable terms are defined and general characteristics of this type of material are given. High temperature ferroelectric materials studied were: lead metaniobate, lithium tantalate, potassium niobate, lead titanate, sodium tantalate, and lead metatantalate. Other ferroelectric materials with less supporting data are discussed also. (Author)

AD-437 309 Div. 14
OTS price $4.60

Hughes Aircraft Co., Culver City, Calif.
LEAD SELENIDE DATA SHEETS,
by M. Neuberger. Dec 62, 48p. Rept. no. DS116
Contract AF33 616 8438, Proj. 7381, Task 738103
Unclassified report

Descriptors: (*Lead compounds, Selenides), (*Semiconductors, Data), Absorption, Absorption spectrum, Single crystals, Photoconductivity, Dielectric properties, Electrical conductance, Resistance (Electrical), Atomic energy levels, Hall effect, Magnetic properties, Photoelectric effect, Refractive index, Surface properties, Thermal conductivity, Thermoelectricity, Crystals, Films, Temperature.

AD-437 310 Div. 14, 25
OTS price $8.60

Hughes Aircraft Co., Culver City, Calif.
GALLIUM ARSENIDE DATA SHEETS,
by M. Neuberger. Nov 62, 97p. Rept. no. DS115
Contract AF33 616 8438, Proj. 7381, Task 738103
Unclassified report

Descriptors: (*Semiconductors, Materials), (*Gallium compounds, Arsenides), (*Arsenides, Gallium compounds), Electrical conductivity, Dielectric properties, Absorption, Diffusion, Emissivity, Atomic energy levels, Hall effect, Radiation damage, Piezoelectric effect, Reflection, Refractive index, Thermal conductivity, Magnetic properties, Work functions, Thermoelectricity, Electrical properties, Transport properties, Bibliographies, Data.

AD-437 355 Div. 14, 4
OTS price $4.60

Olin Mathieson Chemical Corp., New Haven, Conn.
DEVELOPMENT OF NONFLAMMABLE HYDRAULIC FLUIDS

AND LUBRICANTS.
Bimonthly progress rept. no. 3, 18 Feb-17 Apr 64,
by H. F. Lederle. 27 Apr 64, 48p.
Contract NObs90092
Unclassified report

Descriptors: (*Hydraulic fluids, Synthesis (Chemistry)), (*Heat-resistant materials, Hydraulic fluids), Heat, Stability, Spectra (Infrared), Polymers, Aromatic compounds, Fluorine compounds, Organic phosphorus compounds, Organic nitrogen compounds, Ethers.

Additional trimeric and tetrameric mixed substituted (aryl-1, 1-di H-polyfluoroalkyl)phosphonitrilates were prepared and evaluated. Of these, trimeric (m-ethylphenyl-1, 1-di H-trifluoroethyl) phosphonitrilate had the lowest density (1.33) and tetrameric (m-fluorophenyl-1, 1-di H-heptafluorobutyl) phosphonitrilate, the lowest pour point (-45 F) obtained so far in this class of compounds. Trimeric bis(p-methoxyphenyl) phosphonitrilate have been prepared as intermediates for potentially water soluble or emulsifiable products. Two members of a new class of fluids, the trimeric and tetrameric mixed substituted (arylamino-polyfluoroalkoxy) phosphonitriles have been prepared and evaluated. (Author)

AD-437 359 Div. 14, 16
OTS price $1.60

Horizons, Inc., Cleveland, Ohio.
DIFFUSION OF GASES THROUGH PLASTIC MEMBRANES.
Final rept.
1963, 20p.
Contract Nonr44600, Proj. NR107 523
Unclassified report

Descriptors: (*Gases, Diffusion), Membranes, Oxygen, Sea water, Feasibility studies, Liquid filters, Flowmeters, Measurement, Pressure.

AD-437 383 Div. 14
OTS price $4.60

Carborundum Co., Niagara Falls, N. Y.
A STUDY OF FUNDAMENTAL MECHANICAL PROPERTIES OF CERAMIC SINGLE CRYSTALS.
Final rept.,
by R. S. Liebling. 12 Mar 64, 42p.
Contract N600 19 59749
Unclassified report

Descriptors: (*Ceramic materials, Single crystals), (*Mechanical properties, Silicon compounds), Carbides, Fracture (Mechanics), Loading, Heat treatment, Fluorides, Aluminum compounds, Borates, Potassium compounds, Hydroxides, Nitrates.

The object of this investigation has been to study the factors influencing the strength of silicon carbide single crystals and to develop methods of producing extremely strong crystals of predicable strength. Using platelet crystals, cut to desired lengths and widths and having uniform thicknesses, it was possible to account for 81 percent of the variations in fracture loads using the am equation derived from test data. Various abrasive and chemical treatments were employed to modify crystals were tested at 1750 C. Immersion in molten cryolite for 5 to 10 minutes and heating seem to improve strength, but with the exception of a few crystals, no crystals exhibited bend strengths over 150,000 psi. (Author)

AD-437 499 Div. 14, 4
OTS price $1.60

Wyandotte Chemicals Corp., Mich.
IMPREGNANTS FOR EXPANDABLE RIGIDIZABLE AEROSPACE STRUCTURES.
Quarterly progress rept. no. 4, 1 May-31 Jul 63.
31 Jul 63, 18p.
Contract AF33 657 9174, Task 734005
Unclassified report

Descriptors: (*Impregnation, Inflatable structures), (*Inflatable structures, Impregnation), Isocyanate plastics, Aging (Materials), Epoxy plastics, Glass textiles, Nylon, Synthetic rubber, Coatings, Permeability, Gases, Synthesis (Chemistry), Amines, Ketones, Chlorine compounds, Anilines.

Select candidate materials arising from earlier investigations were more fully characterized. Two high purity ketone blocked amines were synthesized and fully characterized. Investigations of a fluted glass fabric, as a candidate component for rigidizable structures, have been initiated. (Author)

AD-437 590 Div. 14, 1
OTS price $1.10

General Dynamics, Fort Worth, Tex.
EMPIRICAL DATA, COMPOSITE FIBERGLASS - METAL INSULATION PANELS FOR F-111 STUDY TRANSIENT TEMPERATURE RESPONSE OF,
by H. J. Weltman. 15 Apr 64, 9p. Rept. no. FTDM 3219
Unclassified report

Descriptors: (*Airplane panels, Thermal insulation), (*Honeycomb cores, Airplane panels), (*Thermal insulation, Airplane panels), Sandwich panels, Glass textiles, Jet fighters, Test methods.

The panels tested included one each of P/N 12FTB010-1, -2, -3, -4, -4 (painted), and a special fiberglass core panel. Transient temperature response data for these six types of construction revealed: (1) the filling of the fiberglass core with glass microspheres lessened rather than improved the insulation properties; (2) the coating of the phenolic surface with acrylic paint FMS-1004 did not significantly affect the insulation properties; and (3) the best insulation properties were demonstrated by panels 12FTB010-3 and -4. The transient temperature responses of these two panels were essentially equal. (Author)

AD-437 592 Div. 14
OTS price $1.10

General Dynamics, Fort Worth, Tex.
MATERIAL - ELECTRICAL POTTING - PRO-SEAL 777 EVALUATION OF,
by H. P. Owen. 15 Apr 64, 6p. Rept. no. FTDM 2910
Unclassified report

Descriptors: (*Sealing compounds, Isocyanate plastics), (*Embedding substances, Isocyanate plastics), (*Isocyanate plastics, Embedding substances), Aging (Materials), Electrical properties, Adhesion, Compatibility, Liquid immersion tests, Aluminum alloys, Stainless steel, Dielectric properties, Military requirements, Test methods, Tests, Physical properties.

AD-437 593 Div. 14, 1
OTS price $1.10

General Dynamics, Fort Worth, Tex.
MATERIALS: FILLETING AND FAYING SURFACE SEALANTS FOR USE IN F-111 INTEGRAL FUEL TANKS - SCREENING TEST OF,
by Gale E. Wood. 15 Apr 64, 9p. Rept. no. FTDM 3210
Unclassified report

Descriptors: (*Sealing compounds, Fuel tanks), (*Fuel tanks, Sealing compounds), Jet fighters, Sea water, Jet engine fuels, Adhesion, Mechanical properties, Density, Test methods, Environmental tests.

Based on screening tests conducted and described herein, the new Q94-002 one-part filleting sealant will withstand the simulated F-111 environmental conditions. It should be noted that this material is 20.6% heavier than the maximum specific gravity requirement, (FMS-0140 paragraph 2.3.2). Both Q94-503 and XS-1402340 appear to be incapable of withstanding the environmental conditions specified for F-111 integral fuel tank sealants. (Author)

AD-437 594 Div. 14, 1
OTS price $1.10

General Dynamics, Fort Worth, Tex.
MATERIALS: FILLET AND FAYING SURFACE TYPE SEALANTS FOR F-111 - SCREENING TEST OF,
by Gale E. Wood. 15 Apr 64, 11p. Rept. no. FTDM 3169
Unclassified report

Descriptors: (*Sealing compounds, Fuel tanks), (*Plastic seals, Fuel tanks), (*Fuel tanks, Sealing compounds), Jet fighters, Jet engine fuels, Sea water, Adhesion, Mechanical properties, Test methods, Environmental tests, Silicone plastics.

Q94-501 A/B is a two-part silicone LS-RTV. It is a reformulation of Q94-500 which had too short a work life for use in production. The work life of Q95-501 was improved somewhat when compared to Q94-500, but it is still too short for production use. Immersion in a 2-layer liquid consisting of salt water and JRF caused Q94-501 to soften and exhibit a low cohesive strength, particularly in the salt water layer. Reversion occurs when the sealant is subjected to 375 F and 400 F heat ageing. Q94-002 is a single-component version of Q94-501 and was tested as a filleting sealant. When immersed in a 2 layer liquid consisting of salt water and JRF, it softened in the salt water layer, the JRF layer and in the fuel vapor above the JRF. Based on tests described herein, neither Q94-501 nor Q94-002 will withstand the simulated F-111 environmental conditions to which they were subjected. (Author)

AD-437 600 Div. 14
OTS price $1.10

General Dynamics, Fort Worth, Tex.
MATERIALS: SEALANTS AND COATINGS - FOR USE IN F-111 INTEGRAL FUEL TANKS - SMALL TANK SCREENING TEST OF,
by Gale E. Wood. 15 Apr 64, 9p. Rept. no. FTDM3165
Unclassified report

Descriptors: (*Fuel tanks, Jet fighters), (*Sealing compounds, Fuel tanks), Coatings, Corrosion inhibition.

AD-437 601 Div. 14
OTS price $1.60

General Dynamics, Fort Worth, Tex.
MATERIAL - SEALANT, SYNTHETIC ELASTOMER - EVALUATION OF SELECTED PROPERTIES OF PR-9422 AND EC-1610,
by J. M. Warren. 15 Apr 64, 12p. Rept. no. FTDM3124
Unclassified report

Descriptors: (*Sealing compounds, Elastomers), (*Fuel tanks, Sealing compounds), Tensile properties, Heat, Failure (Mechanics), Deformation, Viscosity, Aging (Materials), Hardness, Adhesion, Corrosion, Aluminum, Sea water.

A comparison of results obtained from tests conducted on the four sealants show that the JRF is more severe in its effects than the Type III Test Fluid. All sealants tested sponged after being immersed in JRF or Type III for 72 hours at 140 F, followed by heating to 275 F in air. The sponging was more severe after the JRF immersion than after the same immersion conditions in Type III fluid. Tensile and elongation tests on the sealants after immersion in the two test fluids showed similar results, the JRF being the more severe of the two test fluids. (Author)

AD-437 604 Div. 14
OTS price $1.10

General Dynamics, Fort Worth, Tex.
MATERIALS: CHANNEL SEALANTS - FOR USE IN F-111 INTEGRAL FUEL TANKS - SCREENING TEST OF.
15 Apr 64, 8p. Rept. no. FTDM3134
Unclassified report

Descriptors: (*Sealing compounds, Fuel tanks), (*Fuel tanks, Sealing compounds), Pressure, Temperature.

Although no leaks were encountered with any of the four channel sealants tested as described herein, on opening the test tanks at the end of the test, the XS-1402303F appeared to have been least affected by the simulated F-111 environmental conditions. (Author)

AD-437 609 Div. 14, 1
OTS price $1.10

General Dynamics, Fort Worth, Tex.
WING PIVOT - DRY FILM LUBRICANT EVALUATION,
by J. D. Reynolds. 15 Apr 64, 9p. Rept. no. FTDM3113
Unclassified report

Descriptors: (*Lubricants, Solids), (*Solids, Lubricants), (*Films, Lubricants), Wings, Wear resistance, Jet fighters, Test methods, Tests, Plastic coatings.

The wing pivot on the F-111 airplane requires a lubricant capable of withstanding the high bearing loads and environmental conditions anticipated during the service life of the aircraft. One of the most promising methods of lubricating the pivot is to use a solid film lubricant. Wear life determinations were conducted on 7 commercial resin-bonded solid film lubricants. Alpha Molykote X-106, Surf-Kote M1284 and Almasol X-38 exhibited the most satisfactory wear life under the conditions of this test. (Author)

AD-437 751 Div. 14, 4
OTS price $3.60

Polymer Research Inst., Univ. of Mass., Amherst.
THE KINETICS OF CRYSTALLIZATION OF POLYPROPYLENE FRACTIONS II,
by E. Meinecke and R. S. Stein. 27 Aug 63, 34p. TR58
Contract Nonr3357 01, Proj. NR356 378
Unclassified report

Descriptors: (*Polyethylene plastics, Crystallization), Measurement, X-ray diffraction analysis, Polymers, Temperature, Crystal growth, Intensity, Time, Single crystals, Programming (Computers), Nuclei, Supercooling, Nucleation.

Isothermal crystallization rate data for polypropylene films are obtained by a rapid

scanning x-ray diffraction technique. These are compared with previously obtained data on similar samples of the same polymer by microscopic observation of spherulite nucleation and growth rates. The degree of crystallinity is found to increase more slowly than the weight fraction of the sample filled with spherulites, indicating that all of the crystallization does not occur at the growing spherulite surface. A mechanism for this secondary crystallization process occurring within the spherulite is proposed in which the spherulite first forms with an initial degree of crystallinity, and then the crystallization continues approaching a limiting degree of crystallinity. The kinetic parameters characterizing this secondary process are determined and their variation with temperature is studied. (Author)

AD-437 789 Div. 14
OTS price $1.25

Forest Products Lab., Madison, Wis.
STRENGTH PROPERTIES OF REINFORCED PLASTIC LAMINATES AT ELEVATED TEMPERATURES (EPOXY RESIN ERSB-0111 AND 181-A1100 GLASS FABRIC),
by Kenneth H. Boller. Mar 64, 36p.
Contract AF33 657 63 358, Proj. 7381, Task 738103
RTD TDR63 4154 Unclassified report

Report on Materials Application.

Descriptors: (*Heat-resistant plastics, Mechanical properties), (*Laminated plastics, High-temperature research), (*Composite materials, Laminated plastics), (*Epoxy plastics, Composite materials), (*Glass textiles, Laminated plastics), Creep, Tensile properties, Deformation, Stresses, Strain (Mechanics), Compressive properties, Rupture, Shear stresses, Reinforcing materials, Tests, Experimental data.

This report is the eighth in a series that present strength properties of materials designed to endure elevated temperatures. Data have been presented on such laminated materials as silicone-glass, phenolic-glass, silicone-asbestos, phenolic asbestos, epoxy-glass, and phenyl-silane-glass. This report presents strength properties and strength-exposure curves of an epoxy resin laminate, having a special blend of resen labeled ERSB-0111 in conjunction with 181-A1100 glass fabric. Data are presented in both tables and curves. The data show the effects of temperature between 80 and 1,000 F., and exposure periods between 0.05 and 1,000 hours on the individual strength properties. The data also show that the strengths remain relatively constant during most constant temperature exposures until a critical exposure is reached and then drop rapidly. (Author)

AD-437 826 Div. 14
OTS price $14.50

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AN INDEX TO NON METALLICS R&D PROGRAMS OF TEN AEROSPACE COMPANIES.
9 May 63, 216p.
Task 738103
ASD ASRCE TM62 24, suppl. 1
Unclassified report

Descriptors: (*Materials, Industrial research), (*Industrial research, Indexes), Abstracts, Aerospace craft.

This index (Appendix I) is a follow-on to the index presented in ASRCE TM-62-24, and it covers 167 annotated abstracts describing nonmetallics R&D programs being conducted by ten aerospace companies. The abstracts (Appendix II) were assigned index numbers ranging from 236 to 402. All programs described are recent and many are still in progess. Over 300 materials are reported. (Author)

AD-437 886 Div. 14
OTS price $2.60

General Dynamics/Fort Worth, Tex.
MATERIAL - ADHESIVES - AF-33, AF-130 AND METLBOND 329 - ENVIRONMENTAL EXPOSURE OF.
by J. P. Thomas. 15 Apr 64, 21p. Rept. no. FTDM3202
Unclassified report

Descriptors: (*Adhesives, Bonded joints), (*Bonded joints, Adhesives), Aluminum alloys, Sheets, Sandwich panels, Honeycomb cores, Environmental tests, Salt spray tests, Water, Jet engine fuel, Hydraulic fluids, De-icing materials, Tensile properties, Shear stresses.

The effects of MIL-A-5090D environmental exposure requirements were determined on AF-33, AF-130 and Metlbond 329. No significant degradation due to the environmental exposures was determined. (Author)

AD-437 890 Div. 14
OTS price $1.00

Naval Ordnance Lab., White Oak, Md.
THE RESISTIVITY OF AQUEOUS SOLUTIONS OF SODIUM CHLORIDE,
by Martin B. Kraichman. 3 Mar 64, 6p.
NOL TR64 42 Unclassified report

Descriptors: (*Electrolytes, Resistance (Electrical)), (*Sodium compounds, Chlorides), Electrolytic cells, Electrodes, Silver, Silver compounds, Temperature.

Resistivity measurements were made of various aqueous solutions of sodium chloride using a calibrated conductivity cell with silver-silver chloride electrodes. Results in the form of curves are presented for salt concentrations from 1 to 26% in the temperature range from 5 C to 30 C. (Author)

15. MATHEMATICS

AD-435 127 Div. 15
OTS price $3.60

Applied Mathematics and Statistics Labs., Stanford Univ., Calif.
OSCILLATION PROPERTIES OF EIGENVECTORS OF STRICTLY TOTALLY POSITIVE MATRICES,
by Samuel Karlin. 28 Jan 64, 32p. TR 37
Contract Nonr225 28, Proj. NR047 019
Unclassified report

Descriptors: (*Matrix algebra, Oscillation), Determinants, Inequalities, Operators (Mathematics), Polynomials, Green's function.

AD-435 132 Div. 15
OTS price $8.60

Applied Mathematics and Statistics Labs., Stanford Univ., Calif.
ON A CHEBYSHEV-TYPE INEQUALITY FOR SUMS OF INDEPENDENT RANDOM VARIABLES,
by Stephen M. Samuels. 21 Jan 64, 95p. TR 36
Contract Nonr22528, Proj. NR047 019
Unclassified report

Descriptors: (*Inequalities, Statistical functions), (*Probability, Inequalities).

AD-435 477 Div. 15
OTS price $3.60

Naval Ordnance Lab., White Oak, Md.
COMPLEMENTARY INEQUALITIES III: INEQUALITIES COMPLEMENTARY TO SCHWARZ'S INEQUALITY IN HILBERT SPACE,
by J. B. Diaz and F. T. Metcalf. Apr. 64, 40p.
NOL TR64 26; MDR M 46
Unclassified report

Descriptors: (*Inequalities, Operators (Mathematics)), Numerical analysis, Transformations (Mathematics), Numbers, Functional analysis.

The Schwarz inequality in a Hilbert space may be regarded as giving an upper bound for the number in terms of the two squares of the norms. Under certain circumstances there exist complementary inequalities to the Schwarz inequality. Operator inequalities of this general complementary nature are proven. (Author)

AD-435 765 Div. 15
OTS price $3.60

RAND Corp., Santa Monica, Calif.
NONLINEAR EXTRAPOLATION AND TWO-POINT BOUNDARY VALUE PROBLEMS,
by Richard Bellman, Harriet Kagiwada and Robert Kalaba. Apr 64, 13p. RM4079 PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Boundary value problems, Programming (Computers)), (*Differential equations, Numerical methods and procedures), Partial differential equations, Sequences, Linear systems.

It is suggested that the convergence properties of the usual Picard successive approximation scheme may be improved through use of nonlinear extrapolation techniques. A numerical example is provided. (Author)

AD-435 869 Div. 15
OTS price $1.60

RAND Corp., Santa Monica, Calif.
A SEARCH GAME,
by Selmer M. Johnson. Apr 64, 18p. Memo no. RM3717 PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Game theory, Search theory), (*Search theory, Optimization), Probability, Linear programming, Stochastic processes.

A hide-and-seek game is formulated and partially solved. The hider chooses an integer from 1 to n; the hunter makes a guess, is told whether he is too high or too low. The process is repeated until he has guessed correctly. The payoff is the expected number of guesses. Possible practical applications include the problem of correctly weighing an object with minimum expected number of weighings on a balance scale playing against nature. (Author)

AD-435 905 Div. 15
OTS price $1.10

Massachusetts Inst. of Tech., Cambridge.
APPLICATIONS OF GLOBAL ANALYSIS TO MODERN THEORETICAL PHYSICS.
Final technical rept.,
by I. E. Segal. 27 Dec 63, 5p.
Grant AF AFOSR62 229
AFOSR 64 0496 Unclassified report

Descriptors: (*Metamathematics, Research program administration), Field theory, Nonlinear differential equations, Partial differential equations, Quantum mechanics, Operators (Mathematics), Groups (Mathematics), Mathematical logic.

AD-436 095 Div. 15
OTS price $2.60

Minnesota U., Minneapolis.
SURVEILLANCE PROBLEMS: WIENER PROCESSES,
by Gordon R. Antelman and I. Richard Savage.
Jan 64, 25p. Rept. no. TR34
Contract Nonr71031, Proj. NR0420 003
Unclassified report

Descriptors: (*Control systems, Statistical processes), (*Production control, Optimization), Cost, Stochastic processes, Probability, Quality control, Numerical methods and procedures.

Two kinds of surveillance are studied: continuous surveillance, in which errorless observations of $x(t)$ (Wiener process with $x(0) = 0$) are immediately available at no cost at all times of production, and costly surveillance, in which errorless and immediately available observations of $x(t)$ can be made at any times at a positive cost of L each. In either case, the objective is the determination of a strategy which maximizes average income per unit of time. For continuous surveillance, a strategy must specify for every possible process history whether or not the production process should be placed in the repair state. For costly surveillance, a strategy must specify, as a function of previous and current observations and observation times, whether or not the production process should be placed in the repair state and if not, when the next observation should be taken. For continuous surveillance, the only strategies considered are: never placing the production process in the repair state, and placing the process in the repair state as soon as $x(t) = w+1$ $(w > -1)$. For costly surveillance, the only strategies considered are those which are specified by a continuation set. (Author)

AD-436 275 Div. 15
OTS price $6.40

Parke Mathematical Labs., Inc., Carlisle, Mass.
RESEARCH ON ALGEBRAIC AND STATISTICAL THEORY.
Final rept.
Feb 64, 64p.
Contract AF19 604 7493, Proj. 5628
AFCRL 64 139 Unclassified report

Descriptors: (*Algebra, Theory), (*Statistical analysis, Theory), (*Metamathematics, Algebras), Probability, Optimization, Computer logic, Mathematical logic, Networks, Complex variables, Programming (Computers), Dynamic programming, Matrix algebra, Functional analysis, Mapping (Transformations), Recursive functions, Programming languages, Errors, Binary arithmetic, Complex variables.

The results of ''experimental'' work done on the minimization problem for Boolean formulas are discussed. Special examples of minimality, lists of minimal formulas, and pertinent results from the general theory of Boolean formulas developed are collected here in concentrated form. A summary of results from the general theory of Boolean formulas needed for subsequent proofs of minimality is give. (Author)

Division 15 - MATHEMATICS

AD-436 341 Div. 15
OTS price $2.60

Boeing Scientific Research Labs., Seattle, Wash.
HEIGHTS OF CONVEX POLYTOPES,
by Victor Klee. Feb 64, 23p. Mathematical note no. 337p D1 82 0330
Unclassified report

Also available from the author.

Descriptors: (*Linear programming, Convex sets), Combinatorial analysis, Inequalities, Optimization, Sequences, Topology, Series, Mathematical logic.

Though phrased in geometric terms, this report is concerned with the comparative efficiency of various pivot rules for the simplex method of linear programming, in which one seeks to maximize a linear objective function by moving along the edges of the feasible region. The following three rules are considered: (1) from the vertex v, survey the adjacent vertices until a vertex w is found for which the linear function of v is less than that for w, then move to w and continue the process; (2) from the vertex v, survey all of the adjacent vertices in order to find one, say w, at which the linear function has the greatest value; then move to w and continue the process; (3) from the vertex v, survey all of the adjacent vertices in order to find one, say w, for which the slope has the greatest value; then move to w and continue the process. (Author)

AD-436 399 Div. 15
OTS price $1.60

Brown Univ. Div. of Applied Mathematics, Providence, R. I.
TRIANGLE FORMULAS IN THE COMPLEX PLANE,
by Philip J. Davis. 1964, 15p.
Contract Nonr56236
Unclassified report

Descriptors: (*Identities, Mathematical analysis), Mapping, Complex numbers, Integrals, Analytic geometry.

AD-436 408 Div. 15
OTS price $10.50

U. of Liege (Belgium).
DIFFERENTIAL EQUATIONS WITH FIXED CRITICAL POINTS. PART II. EQUATIONS OF THE THIRD ORDER PART II. EQUATIONS OF ORDER FOUR,
by F. J. Bureau. Nov 63, 137p.
Contract AF61 052 612
AFOSR 4866 pts. 2 and 3
Unclassified report

Descriptors: (*Differential equations, Polynomials), Numerical methods and procedures, Integrals, Stability, Functions.

AD-436 454 Div. 15
OTS price $5.60

Graduate School of Industrial Administration, Carnegie Inst. of Tech., Pittsburgh, Pa.
A BOUND ESCALATION METHOD FOR THE SOLUTION OF INTEGER LINEAR PROGRAMS,
by Fred Glover. Dec 63, 58p. Rept. no. ONR RM119
Contract Nonr270024
Unclassified report

Descriptors: (*Linear programming, Iterative methods), Integration, Transformations (Mathematics), Matrix algebra, Functions.

An algorithm for solving integer programming problems is presented which transforms an integer matrix into a new integer matrix exhibiting a special substructure called the bounding form. The bound escalation method operates on this substructure in two stages to yield integer lower bounds for a subset of the problem variables, and this information is utilized in conjunction with the successively derived problem matrices to guarantee convergence to the optimal solution for the original problem in a finite number of steps. Three example problems are solved illustrating various aspects of the algorithm's performance. In a concluding section it is shown that Gomory's all integer method may be interpreted as a variation of the bound escalation method under restricted rules of choice. (Author)

AD-436 459 Div. 15, 32
OTS price $3.60

Graduate School of Industrial Administration, Carnegie Inst. of Tech., Pittsburgh, Pa.
MODELS FOR APPRAISING INVESTMENTS YIELDING STOCHASTIC RETURNS,
by D. P. Gaver, Jr. Mar 64, 32p. Rept. no. ONR RM118
Contract Nonr 270024
Unclassified report

Descriptors: (*Mathematical models, Stochastic processes). (*Economics, Queueing theory), Probability, Costs, Industries, Distribution theory, Sequential analysis, Money, Operations research, Scheduling.

Stochastic models for return on investment when ruin may occur are treated. However, this model recognizes the possibility that one organization will not necessarily continue forever in one form, subsisting on a single enterprise or project. Rather, alert organizations will develop replacements of current profit-making enterprises in anticipation either of damaging adverse business fluctuations or of a sudden catastrophic change in economic climate, such as is caused by competitive innovations. If a replacement is at hand when profits from the current enterprise cease, withdrawals may continue. Some models for describing and evaluating such a replacement process are suggested. (Author)

AD-436 547 Div. 15
OTS price $1.60

Mathematics Department, Stanford Univ., Calif.
IDENTIFIABILITY OF MIXTURES OF EXPONENTIAL FAMILIES,
by O. Barndorff-Nielsen. 17 Feb 64, 12p.
Technical rept. no. 38
Contract Nonr225 28, Proj. NR047 019
Unclassified report

Descriptors: (*Complex numbers, Statistical functions), Special functions, Mixtures, Mathematical analysis.

AD-436 570 Div. 15, 16
OTS price $1.10

New York State Coll. of Agriculture, Cornell Univ., Ithaca.
A MODEL FOR ADDITIVE CROSS-OVER UNITS IN GENETIC LINKAGE ANALYSIS,
by D. S. Robson. Mar 64, 6p. Rept. nos. TR17, BU164M
Contract Nonr401 39, Proj. NR042 212
Unclassified report

Descriptors: (*Genetics, Analysis), Mathematical models, Probability, Chromosomes, Statistical analysis, Mathematical analysis.

If the number of cross-overs occurring between two loci is a Poisson random variable with mean

gamma rays then the probability of an odd number of cross-overs is p = (1-e to the minus 2 gamma power)/2. Cross-over units measured on the scale of gamma rays = - (log(1-2p))/2 rather than on the p-scale would therefore be additive. (Author)

AD-436 574 Div. 15
OTS price $1.10

New York State Coll. of Agriculture, Cornell Univ., Ithaca.
MOMENTS OF THE ABSORPTION TIME IN A FINITE MARKOV CHAIN,
by D. S. Robson. Mar 64, 5p. TR16, BU163M
Contract Nonr401 39, Proj. NR042 212
Unclassified report

Descriptors: (*Statistics, Biology), (*Biology, Statistics), Probability, Theory, Statistical functions, Equations.

AD-436 575 Div. 15
OTS price $1.10

Columbia Univ., New York.
THE USE OF A BALLOT THEOREM IN ORDER STATISTICS,
by Lajos Takacs. 24 Jan 64, 10p. Rept. no. CU39 64Nonr266 59MS
Contract Nonr266 59, Proj. NR042 205
Unclassified report

Descriptors: (*Sequences, Queuing theory), (*Probability, Distribution theory), Distribution, Statistical functions, Combinatorial analysis, Statistical tests, Series.

AD-436 583 Div. 15, 16
OTS price $2.60

New York State Coll. of Agriculture, Cornell Univ., Ithaca.
THE APPROACH TO HOMOZYGOSITY IN A DIPLOID SELFING SERIES WITH NO MUTATION OR SELECTION,
by D. S. Robson. Mar 64, 22p. TR15, BU162M
Contract Nonr401 39,Proj. NR042 212
Unclassified report

Descriptors: (*Genetic, Selection), Mutations, Probability, Mathematical analysis, Chromosomes.

In a diploid selfing series the expected rate of loss of heterozygosity is 50% per generation, provided that mutations and selection do not occur. If the heterozygous loci are randomly distributed over the n chromosome pairs then deviations from this mean rate must be approximately normally distributed and hence essentially dependent only on the cross-over probabilities between pairs of loci. The variance in this case indicates that a large number of linked loci will effectively behave the same as 1.5 nk unlinked loci, where 50 k is the average chromosome length measured in cross-over units. For N independently segregating loci the most probable number of generations required to reach complete homozygosity is approximately log2N, and there is a 50% chance of achieving this state before - log2 (1-2 to the minus 1 over N power) generations have elapsed. The mathematical analysis of this system is facilitated by its representation as a Markov chain. (Author)

AD-436 661 Div. 15
OTS price $1.10

Columbia Univ., New York.
AN APPLICATION OF A BALLOT THEOREM IN ORDER STATISTICS,
by Lajos Takacs. 27 Jan 64, 6p. Rept. no. 40 64
Contract Nonr26659, Proj. 042 205
Unclassified report

Descriptors: (*Probability, Statistical functions), (*Sequences, Distribution theory), (*Distribution theory, Statistical functions), Combinatorial analysis.

AD-436 662 Div. 15
OTS price $3.60

Columbia Univ., New York.
FROM BALLOT THEOREMS TO THE THEORY OF QUEUES,
by Lajos Takacs. 2 Mar 64, 35p. Rept. no. 41 64
Contract Nonr26659, Proj. 042 205
Unclassified report

Descriptors: (*Queueing theory, Distribution theory), (*Probability, Distribution theory), (*Distribution theory, Queueing theory), (*Stochastic processes, Distribution theory), Sequences, Difference equations, Integral transforms, Time, Statistical functions.

A discussion is presented of a single-server queue with Poisson input and general service times and illustrates that all important problems concerning the queue size, the waiting time and the busy period can be solved in an elementary way by using only two generalizations of the classical ballot theorem. (Author)

AD-436 663 Div. 15
OTS price $2.60

Columbia Univ., New York.
ON THE DISTRIBUTION OF THE SUPREMUM FOR STOCHASTIC PROCESSES WITH INTERCHANGEABLE INCREMENTS,
by Lajos Takacs. 30 Mar 64, 27p. Rept. no. 42 64
Contract Nonr26659, Proj. 042 205
Unclassified report

Descriptors: (*Stochastic processes, Theory), Queueing theory, Scheduling, Iterative methods, Bessel functions, Probability, Distribution theory.

AD-436 664 Div. 15
OTS price $1.60

Columbia Univ., New York.
APPLICATIONS OF A BALLOT THEOREM IN PHYSICS AND IN ORDER STATISTICS,
by Lajos Takacs. 2 Apr 64, 16p. Rept. no. 43 64
Contract Nonr26659, Proj. 042 205
Unclassified report

Descriptors: (*Statistical mechanics, Statistical functions), (*Probability, Distribution theory), (*Distribution theory, Probability), Stochastic processes, Electrons, Ionization.

Solutions are presented to the problems of the distribution of the number of gas molecules ionized by an electron passing through an electron tube and the distribution of the deviation of empirical and theoretical distribution functions when the sample size is a random variable having a Poisson distribution. (Author)

AD-436 753 Div. 15
OTS price $1.10

RAND Corp., Santa Monica, Calif.
ON THE COMPUTATIONAL SOLUTION OF TWO-POINT

BOUNDARY-VALUE PROBLEMS,
by Richard Bellman and Thomas A. Brown. Apr 64, 10p. Memo. no. RM3857PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Boundary value problems, Iterative methods), Sequences, Matrix algebra, Transformations (Mathematics), Numerical methods and procedures.

Two-point boundary-value problems for second-order systems of linear differential equations are usually solved by a process involving the inversion of a certain matrix. If the system is too large, it may be difficult to compute this inverse to a high degree of accuracy. The purpose of this paper is to demonstrate that this difficulty can in some cases be circumvented by applying a method like that of Bodewig and Hotelling. (Author)

AD-436 763 Div. 15
OTS price $9.60

Aerospace Research Lab., Office of Aerospace Research, Wright-Patterson AFB, Ohio.
EXPECTED VALUES OF EXPONENTIAL, WEIBULL, AND GAMMA ORDER STATISTICS,
by H. Leon Harter. Feb 64, 112p.
Proj. 7071, Task 7071 01
ARL 64 31 Unclassified report

Descriptors: (*Tables, Population (Mathematics)), (*Population (Mathematics), Tables), Special functions, Programming languages, Probability, Statistical distribution, Sampling, Series.

Five-decimal-place tables, accurate to within a unit in the last place, are given of the expected values of the Mth order statistics M = 1 (1) N of samples of size N from the exponential population N - 1(1) 120 and from the Weibull and Gamma populations N = 1(1) 40. In each case, the values of the location and scale parameters are assumed to be 0 and 1, respectively. Results are tabulated for the Weibull population with shape parameter K = 0.50(0.5)4(1)8 and for the Gamma population with shape parameter a = 0.5(0.5)4, as well as for the exponential population, which is a special case (shape parameter 1) of each of the other two populations. Also given is an eight-decimal-place table, accurate to within a unit in the last place, of the moments (means, variance, skewness, and kurtosis) of the exponential population and of the Weibull and Gamma populations with the above-mentioned values of the shape parameters. The mathematical formulations are given, along with a description of the methods of computation and a discussion of uses of the tables. (Author)

AD-436 818 Div. 15
OTS price $8.10

Brown Univ., Providence, R. I., Div. of Applied Mathematics.
ESTIMATES OF THE BISPECTRUM OF STATIONARY RANDOM PROCESSES,
by M. Rosenblatt and J. W. VAN Ness. Mar 64, 83p.
Rept. no. TR11
Contract Nonr562 29, Proj. NR042 217
Unclassified report

Descriptors: (*Harmonic analysis, Set theory), (*Statistical functions, Sequences), Tables, Statistical analysis, Series, Fourier analysis, Integral transforms, Probability, Stochastic processes, Statistical processes.

Recently interest has arisen in applications of higher order spectra and in particular in the bispectrum. Various nonlinear effects in random phenomena are studied. The bispectrum has been in Connection with oceanographic problems, among which a number of interesting phenomena such as surf beats, wave breaking, and the energy transfer between wave components can be explained only by the nonlinearity of the wave motion. The present paper discusses the bispectrum itself, some of its properties, and some assumptions on it and on the process. Intuitive reasons for choosing an estimate of the form discussed here are then given along with some convenient expressions for this estimate. Further explanation is given for the concept of cumulant functions of the process, and the statistical properties of various estimates; that is with the asymptotic bias, second-order moments, and distribution of three estimates: (1) the third-order moment estimate, (2) the weighted bispectral density (the bispectral distribution function) estimate, and finally (3) the estimate of the bispectral density itself. (Author)

AD-436 838 Div. 15
OTS price $2.60

Brown U., Div. of Applied Mathematics, Providence, R. I.
SOME FURTHER RESULTS OF CENTRAL LIMIT THEOREMS FOR NON-LINEAR FUNCTIONS OF A NORMAL STATIONARY PROCESS,
by Tze-Chien Sun. Apr 64, 24p. Rept. no. TR12
Contract Nonr56229, Proj. NR042 217
Unclassified report

Descriptors: (*Statistical processes, Nonlinear systems), Series, Polynomials, Statistical functions, Time.

AD-437 116 Div. 15, 30
OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AN ALGORITHM FOR BOUNDARY PROBLEM SOLUTION,
by R. I. Stakhovskiy. 20 Mar 64, 25p.
FTD TT63 1078 Unclassified report

Trans. from Avtomatika I Telemekhanika, 24:7, pp. 962-974, 1963.

Descriptors: (*Boundary value problems, Numerical analysis), (*Control systems, (*Optimization), Automatic, Differential equations, Dynamic programming, Automation, Synthesis, Analog computers, Set theory, Functions.

An algorithm for computer solution of boundary problems is proposed. A modification of the direct search method is discussed with respect to the given algorithm. Proof of the uniqueness of the minimum of the adopted optimization criterion is given for certain classes of differential equations describing the controlled plant. (Author)

AD-437 155 Div. 15
OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
THE GOURSAT PROBLEM FOR THE PARTIAL DIFFERENTIAL EQUATION U SUB XYZ EQUALS A MIRAGE,
by Sherwood C. Chu and J. B. Diaz. 2 Mar 64, 11p.
NOL TR64 38 Unclassified report

Descriptors: (*Boundary value problems, Partial differential equations), Special functions.

A typical boundary value problem for the hyperbolic equation consists in prescribing the un-

known function u(x,y) along two plane curves. This so called Goursat problem, under suitable hypotheses, is known to possess always a classical solution. However, it it shown here, by means of a simple example, that the Goursat problem for the partial differential equation which consists of prescribing the unknown function u(x,y,z) on three surfaces, does not, in general, possess a classical solution. (Author)

AD-437 197 Div. 15
OTS price $1.60

Brown Univ. Providence, R. I., Div. of Applied Mathematics.
BOUNDS FOR EIGENVALUES OF SOME DIFFERENTIAL OPERATORS BY THE RAYLEIGH-RITZ METHOD,
by Burton Wendroff. 1963, 16p.
Contract Nonr562 36
Unclassified report

Descriptors: (*Differential equations, Transformations (Mathematics)), (*Boundary value problems, Transformations (Mathematics)), Functions, Boundary value problems, Operators (Mathematics), Inequalities, Identities.

AD-437 207 Div. 15
OTS price $3.60

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
A COMPUTER METHOD FOR CALCULATION OF THE COMPLETE AND INCOMPLETE ELLIPTIC INTEGRALS OF THE THIRD KIND,
by D. K. Ai and Z. L. Harrison. Feb 64, 34p.
Rept. no. E 110 3
Contract Nonr22043
Unclassified report

Descriptors: (*Programming (Computers), Integrals), (*Integrals, Numerical analysis), Special functions, Programming languages, Series.

Numberical approximations and a Fortran IV program are given for the calculation by an IBM 7090 computer of the complete and incomplete elliptic integrals of the third kind. In its present form results are limited to six decimal places, but the method is valid for all values of amplitude, modulus and real values of the parameter a squard. For the purpose of completeness, adaptations of other programs for complete and incomplete elliptic integrals of the first and second kind are also presented. (Author)

AD-437 236 Div. 15
OTS price $1.60

Geneva Univ. (Switzerland).
ORTHOGONAL AND PARTIALLY BALANCED ARRAYS AND THEIR APPLICATION IN DESIGN OF EXPERIMENTS,
by I. M. Chakravarti. 17 June 63, 18p. Rept. no. TR11
Contract AF61 052 648
ARL 63 153 Unclassified report

Descriptors: (*Matrix algebra, Series), Permutations, Switzerland, Inequalities.

AD-437 287 Div. 15
OTS price $1.10

Mathematics Research Center, Univ. of Wisconsin, Madison.
CASCADED COUNTERS WITH FEEDBACK,
by Michael Yoeli. Mar 64, 8p. Rept. no. TSR467
Contract DA11 0220RD2059
Unclassified report

Descriptors: (*Measuring devices, Binary arithmetics, Cascade structures, Feedback, Counting methods, Mathematical models, Algebras.

A general formula for the count of cascaded counters with feedback is derived. The result is obtained by the application of signal flow graph techniques to directed graphs labeled by elements of an associative semiring. (Author)

AD-437 288 Div. 15
OTS price $3.60

Mathematics Research Center, Univ. of Wisconsin, Madison.
ON APPROXIMATING EXTREMALS OF FUNCTIONALS. PART I: THE METHOD AND EXAMPLES FOR BOUNDARY VALUE PROBLEMS,
by Donald Greenspan. Mar 64, 33p. Rept. no. TSR466
Contract DA11 0220RD2059
Unclassified report

Descriptors: (*Boundary value problems, Numerical analysis), Difference equations, Equations, Mathematical analysis, Digital systems, Geodesics.

A new numerical method for a class of nonlinear boundary value problems is described and a variety of examples are presented to indicate its potential value. The essential idea is to apply finite difference methods to a functional rather than to the Euler differential equation of that functional. Applications are made to problems in minimal surfaces, geodesics, and subsonic flows, which were previously inaccessible. (Author)

AD-437 290 Div. 15
OTS price $2.60

Mathematics Research Center, Univ. of Wisconsin, Madison.
PROPERTIES OF SOLUTIONS OF QUASI-DIFFERENTIAL EQUATIONS,
by T. L. Sherman. Mar 64, 22p. Rept. no. TSR457
Contract DA11 0220RD2059
Unclassified report

Descriptors: (*Differential equations, Operators (Mathematics), Theorems, Sequences, Transformations (Mathematics).

The connection between quasi-differential equations, first introduced by D. Shin, and real canonical differential equations is discussed and some basic oscillation properties are derived. (Author)

AD-437 291 Div. 15
OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
EXISTENCE AND STABILITY OF ALMOST PERIODIC SOLUTIONS OF DIFFERENTIAL EQUATIONS IN BANACH SPACES,
by C. T. Taam. Mar 64, 29p. TSR 455
Contract DA11 0220RD2059
Unclassified report

Descriptors: (*Nonlinear differential equations, Functional analysis), Topology, Mapping, Mathematical analysis, Transformations (Mathematics).

Conditions are obtained for certain nonlinear differential equations in a Banach space to possess a unique almost periodic solution which is positively asymptotically stable and negatively unstable. The streatment rests mainly on careful study of certain mappings between the space of almost periodic functions and the space of generalized almost periodic functions. (Author)

Division 15 - MATHEMATICS

AD-437 292 Div. 15, 5
OTS price $3.60

Mathematics Research Center, U. of Wisconsin, Madison.
ASYMPTOTIC FORMS OF DETECTORS OF SIGNALS IN NOISE, by William L. Root. Feb 64, 39p. TSR 456
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Communication theory, Signals), Noise, Detection, Probability, Stochastic processes, Statistical processes, Matched filters, Mathematical models, Mathematical analysis.

Two results in signal detection theory are derived and discussed, backed up by an expository sketch of known theory to serve as foundation and motivation. The first result is a precise statement and proof of an approximation, asymptotically correct as the observation interval becomes infinite, to what is usually called the optimum detector for sure signals in Gaussian noise. The form of this approximation is well known, but apparently it has previously only been justified heuristically. The second result is the determination of a detector of noise-like signals in noise which has the merit of minimizing asymptotically a certain bound on the errors from among a wide class of quadratic detectors, specified in a completely practical way. A theorem giving asymptotic expressions for the mean and variance of a class of estimators of power spectral density, of more or less standard type, is used in this discussion and is proved in an appendix. (Author)

AD-437 293 Div. 15
OTS price $2.60

Mathematics Research Center, Univ. of Wisconsin, Madison.
METHOD OF INDETERMINANT COEFFICIENTS IN LINEAR DIFFERENTIAL SYSTEMS AND THE MATRIX EQUATION XB - AX = U,
by A. Dou. Mar 64, 24p. Rept. no. TSR452
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Differential equations, Linear systems), (*Matrix algebra, Polynomials), Complex numbers.

The paper considers the linear ordinary differential system with constant coefficients. An explicit solution of the system is stated in finite terms. By means of this solution, a theoretical ground is stated for the application of the method of indeterminate coefficients to the obtaining of a particular solution of the system. A particular case is analyzed. A correspondence is established between the differential systems and the matrix equation XB - AX = U. The general solution of the matrix equation is obtained by means of the results previously proved and of the general theory of the differential systems with constant coefficients. (Author)

AD-437 314 Div. 15
OTS price $1.10

King's Coll., U. of London, Cambridge (England).
ASYMPTOTIC PROPERTIES OF FIELDS AND SPACE-TIMES, by Roger Penrose. 14 Dec 62, 10p. Rept. no. TN7
Contract AF61 052 457
ARL 63 69 Unclassified report

Descriptors: (*Relativity theory, Conformal mapping), Gravity, Field theory, Energy, Momentum, Groups (Mathematics), Transformations (Mathematics), Algebraic topology, Time.

A new technique for studying asymptotic questions in general relativity is presented. Points at infinity are introduced which constitute a null hypersurface boundary to space-time. This is studied from the point of view of its conformal structure and some new light is shed on the following questions: (1) asymptotic flatness, (2) gravitational radiation fields, (3) peeling off property of the Riemann tensor, (4) total energy-momentum with integral conservation laws, (5) characteristic initial value problem and (6) Bondi-Metzner-Sachs asymptotic symmetry group. (Author)

AD-437 315 Div. 15
OTS price $1.60

King's Coll., U. of London, Cambridge (England).
THE LIGHT-CONE AT INFINITY.
by Roger Penrose. 14 Dec 62, 11p. Rept. no. TN8
Contract AF61 052 457
ARL 63 70 Unclassified report

Descriptors: (*Conical bodies, Field theory), Relativity, Gravity, Time, Conformal mapping, Transformations (Mathematics), Algebraic topology, S-matrix.

From the point of view of the conformal structure of space-time, points at infinity can be treated on the same basis as finite points. Minkowski space can be completed to a highly symmetrical conformal manifold by the addition of a null cone at infinity - the absolute cone. Owing to their conformal invariance, zero rest-mass fields can be studied on the whole of this conformal manifold. The behaviour of the fields on the absolute cone can be used to define the radiation fields. General relativity can be treated from this point of view if the gravitational field is represented by an expression originally equal to the Weyl tensor but which transforms slightly differently under conformal transformation. (Author)

AD-437 748 Div. 15
OTS price $2.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
AVERGINGS AND QUADRATIC EQUATIONS IN OPERATORS, by V. J. Mizel and M. M. Rao. Oct 63, 30p.
TR9; ORD 16 TR9
Contract DA36 061ORD447, DA Proj. 5B99 01 004; Proj. 1280
AROD 1230 10 Unclassified report

Descriptors: (*Operators (Mathematics), Equations), Set theory, Functional analysis, Mapping (Transformations), Sequences, Algebras.

In this paper, bounded linear operators in Hilbert space satisfying general quadratic equations are characterized. Necessary and sufficient conditions for sets of operators satisfying two such equations to compare relative to a weak ordering, are presented. In addition the averaging operators in finite dimensional spaces are determined and, in this case, it is shown that the averagings are unitary models for all projections. By a counterexample, it is pointed out that the latter result does not in general extend to the infinite dimensional case. (Author)

AD-437 757 Div. 15
OTS price $2.60

Michigan Univ., Ann Arbor.
PERTURBATION ANALYTICITY AND AXIOMATIC ANALYTICITY. I. CONNECTION OF LANDAU EQUATIONS WITH JOST DANAD MANIFOLD,
by Alfred C. T. Wu. 1964, 22p.
Unclassified report

Descriptors: (*Field theory, Functions), (*Topology, Functions), Matrix calculus, Perturbation theory.

It is shown that for a certain class of Feynman graphs the singularity manifold as given by the Landau equations can be parameterized in a form very similar to Jost DANAD. In particular for n=4, the boundary to this perturbation singularity domain is shown to be precisely the p-space DANAD called (DANAD)'. The relationship between (DANAD)' and DANAD is a precise generalization of the relationship which exists between Kallen-Wightman F' sub kl and F sub kl surfaces for the 3-point function case. In particular, the present result implies that the envelope of holomorphy of the union of permuted tubes cannot be continued beyond (DANAD)'. Since (DANAD)' defines a natural domain of holomorphy, it is very suggestive that (DANAD)' might very well turn out to be part of the envelope of holomorphy. (Author)

AD-437 788 Div. 15
OTS price $1.60

Redstone Scientific Information Center, Redstone Arsenal, Ala.
CERTAIN PROBLEMS CONCERNING OSCILLATIONS OF SOLUTIONS TO SECOND-ORDER NONLINEAR NONAUTONOMOUS EQUATIONS,
by V. N. Shevelo and V. G. Shtelik. 25 Oct 63, 12p.
RSIC 88 Unclassified report

Trans. from Doklady Akademii Nauk SSSR, 149:2, pp. 276-279, 1963.

Descriptors: (*Oscillation, Theory), (*Nonlinear systems, Equations), Stability, Set theory, USSR, Identifies, Taylor's series, Special functions.

Certain problems are considered in the theory of oscillations in solutions to nonlinear nonautonomous systems from the point of view of the existence of several equilibrium positions. The motions of such systems are classified and certain problems concerning their oscillations are formulated. A class of equations is considered for which the nature of the oscillations in their solutions is independent of the initial conditions. Certain results connected with finding domains of oscillation (nonoscillation) and the behavior of the analog of the amplitude of oscillatory motion is also discussed. (Author)

AD-437 889 Div. 15
OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
REMARKS ON A GENERALIZATION OF BANACH'S PRINCIPLE OF CONTRACTION MAPPINGS,
by Sherwood C. Chu and J. B. Diaz. 2 Mar 64, 14p.
NOL TR64 39 Unclassified report

Descriptors: (*Mapping (Transformations), Functional analysis), Transformations (Mathematics).

A generalization of Banach's principle of contraction mappings appears in a bood on fundamental analysis by Kolmogorov and Fomin. The purposes of this note is to show that this generalization is a special case of an elementary fact. (Author)

AD-437 899 Div. 15
OTS price $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
REVERSIBILITY OF THE LIOUVILLE EQUATION AND THE APPROACH TO EQUILIBRIUM,
by B. Leaf and W. C. Schieve. 20 Mar 64, 37p.
NRDL TR734 Unclassified report

Descriptors: (*Statistical mechanics, Partial differential equations), Special functions, Irreversible processes, Probability, Statistical functions, Transformations (Mathematics), Integral equations, Green's function.

16. MEDICAL SCIENCES

AD-435 495 Div. 16
OTS price $38.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PROBLEMS OF THE PHYSIOLOGY AND PATHOLOGY OF HIGHER NERVOUS ACTIVITY IN MAN AND ANIMAL.
5 Dec 63, 1039p.
FTD TT63 651 Unclassified report

Trans. from Trudy Instituta Fiziologii, Vol. 8, pp. 1-632, 1959.

Descriptors: (*Nervous system, Physiology), Pathology, Dogs, Cerebral cortex, X rays, Visual perception, Brain, Reproduction (Physiology), Stimulation, Parathyroid glands, Conditioned reflex, Diabetes, Biochemistry, Nitrogen, Nicotinic acid, Metabolism, Determination, Phosphorus, Blood.

AD-435 496 Div. 16
OTS price $13.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
MATERIALS ON THE STUDY OF FLORA AND VEGETATION OF THE URAL.
20 Jan 64, 195p.
FTD TT63 665 Unclassified report

Trans. from Materialy Po Izucheniyu Flory I Rastite'Nosti Urala I, Issue 28, pp. 1-130, 1962.

Descriptors: (*Plants (Botany), USSR), (*Ecology, Plants (Botany)), Geography, Rivers, Terrain, Soils, Grasses, Polar regions, Forestry, Swamps, Rusts (Microorganisms).

AD-435 500 Div. 16
OTS price $2.60

Foreign Technology Div., Wright-Patterson AFB, Ohio.
PROBLEM OF ELECTRONARCOSIS AND ELECTRO-SLEEP,
by Z. Servit and Ya. Burets. 13 Feb 64, 21p.
FTD TT63 931 Unclassified report

Trans. from Chekhoslovatskaya Fiziologiya 2:4, pp. 337-346, 1953.

Descriptors: (*Sleep, Therapy), Electric currents, Brain, Dogs, Reviews, Inhibition, Stimulation, Cats, Mice, Pharmacology, USSR.

AD-435 526 Div. 16
OTS price $2.60

Foreign Technology Div., Wright-Patterson AFB, Ohio.
THE STATE OF WEIGHTLESSNESS AND ARTIFICIAL GRAVITY,
by I. I. Kas'yan and V. I. Kopanev. 20 Mar 64, 25p.
FTD TT64 140 Unclassified report

Trans. from Izvestiya Akademiya Nauk SSR, Seriya

Biologicheskaya, No. 6, pp. 880-891, 1963.

Descriptors: (*Weightlessness, Space Medicine), (*Acceleration tolerance, Medical research), Gravity (Artificial), Psychomotor tests, Performance (Human), Sensitivity, Perception, Behavior, Sensory deprivation, Nervous system, Space flight.

AD-435 734 Div. 16
OTS price $.75

Northrop Space Lab., Hawthorne, Calif.
MODEL ASTRONAUT RADIATION DOSE DISTRIBUTION ANALYSIS.
Rept. for Jul-Sep 63,
by R. E. Fortney and G. E. Duckworth. Feb 64, 21p. Rept. no. 63 172
Contract AF33 657 11010, Proj. 6301, Task 630101
AMRL TDR64 9 Unclassified report

Report on Aerospace Systems Personnel Protection.

Descriptors: (*Radiation tolerance, Astronauts), (*Radiological dosage, Space flight), (*Space flight, Radiation tolerance), Models (Simulations), Space environmental conditions, Van Allen radiation belt, Solar flares, Protons, Manned spacecraft, Dose rate, Radiobiology, Mathematical models, Shielding.

Radiation tolerance levels vary for the diffenent vital body organs and, therefore, the radiation dose distribution in an astronaut may be critical in future space endeavors. This study was initiated to determine analytically the dose distribution inside a model astronaut. The basis of the mathematical formulation for determining this distribution is presented in this report. Particles of the ambient environment were assumed to impinge isotropically on the APOLLO Command Module (CM). The radiation was attenuated through a typical vehicle wall thickness and mean dose rates at various depths in a model astronaut were calculated. Four depths were investigated, each having approximately 175 points at which the dose was calculated. Two spectra were considered one for Van Allen protons and the other representing solar flare protons. The results are presented in graphical form, giving dose versus depth in the model astronaut. (Author)

AD-435 776 Div. 16
OTS price $.50

Industrial Biology Research and Testing Lab., Inc., Philadelphia, Pa.
CUTANEOUS TOXICITY EVALUATION OF AIR FORCE DEVELOPMENT MATERIALS-VI.
Rept. for Oct 62-Jan 64,
by Morris V. Shelanski. Feb 64, 11p.
Contract AF33 657 8900, Proj. 6302, Task 630201
AMRL TDR64 13 Unclassified report

Report on Toxic Hazards of Propellants and Materials.

Descriptors: (*Toxicity, Chemical compounds), (*Propellants, Hazards), (*Skin, Toxic tolerances), Tests, Sensitivity, Materials, Air Force personnel.

Ten Air Force development materials were studied via the prophetic patch test method on laboratory animals to determine the primary irritant effect, gross sensitization index, and gross percutaneous toxicity of these materials. The patch test studies with rabbits indicated that three of the materials showed very mild primary irritant action. None of the materials produced any sensitization or gross systemic poisoning. Dermal reactions on rabbits were so mild that testing on humans was not precluded. The materials were, therefore, tested on human volunteers by the Shelanski repeated insult patch test. Results of this test indicated that all of the materials were safe to use on contact with human skin. (Author)

AD-435 919 Div. 16
OTS price $1.10

Stanford U., Calif.
THE PHYSIOLOGY OF CRUSTACEAN INTERNEURONS.
Final rept.,
by Donald Kennedy. 1963, 8p.
Grant AF AFOSR62 147
AFOSR 64 0491 Unclassified report

Descriptors: (*Crustacea, Nerve fibers). (*Nerve fibers, Crustacea). Photosensitivity (Biological). Nerve impulses, Nerve cells, Physiology, End organs, Motor reactions, Electric potential.

AD-435 982 Div. 16, 30
OTS price $5.00

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
1963 BIONICS SYMPOSIUM 19-20-21 MARCH, INFORMATION PROCESSING BY LIVING ORGANISMS AND MACHINES.
Mar 64, 360p.
ASD TDR63 946 Unclassified report

Descriptors: (*Bionics, Symposia), (*Symposia, Bionics), (*Artificial intelligence, Medical research), Network, Models (Simulations), Nerve cells, Nervous system, Mathematical models, Color vision, Auditory perception, Learning, Data processing systems, Behavior, Training devices, Cybernetics, Computers, Communication theory, Mathematical logic.

This report compiles papers presented in the invited sessions at the Bionics Symposium 1963 held 19-21 March 1963 at Dayton, Ohio. These sessions are devoted to the subject Information Processing by Living Organisms and Machines and have the followint titles: I. General Session; II. Signal Reception by Living Organisms; III. Information Processing by Living Organisms; IV. Physical Principles of Bionics; and V. Application of Bionic Concepts. Biological, mathematical, and engineering papers are equally represented attacking the problem of understanding and simulating the sophisticated information processing capabilities of living organisms by artificial means. (Author)

AD-435 994 Div. 16
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SOME RESULTS AND PROBLEMS IN THE FIELD OF SPACE RADIOBIOLOGY.
by P. P. Saksonov, V. V. Antunov, and N. N. Dobrov. 23 Mar 64, 14p.
FTD TT63 33 Unclassified report

Trans. from Vestnik Akademii Meditsinskikh Nauk SSSR, No. 8, pp. 13-20, 1963.

Descriptors: (*Radiobiology, Space flight). (*Space flight, Radiobiology). (*Radiation effects, Cosmic rays). Space environmental conditions, Protons, Solar radiation, Hemopoietic system, Genetics, Radiological dosage, Radioprotective agents, Radiation tolerance.

AD-436 013 Div. 16
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
APPARATUS FOR DELIVERY OF PURE OXYGEN AND THE MEASUREMENT OF ITS CONSUPTION IN CHRONIC EXPERIMENTS WITH SMALL ANIMALS,
by I. S. Breslav. 24 Mar 64, 10p.
FTD TT63 1118 Unclassified report

Trans from Fiziologicheskiy Zhurnal SSR, 49:9 pp. 1116-1120, 1963.

Descriptors: (*Oxygen equipment, Medical research), Operation, Design, Oxygen consuption, Measurement, Gas flow, Gas generating systems, Barometric pressure.

AD-436 045 Div. 16
OTS price $2.60

Medical Coll. of South Carolina, Charleston.
THE CARDIAC OUTPUT AND VASCULAR RESPONSE TO TRAUMA.
Annual progress rept., 1 Apr 63-31 Mar 64,
by George H. A. Clowes, Jr. 31 Mar 64, 27p.
Contract DA49 193md2312
Unclassified report

Descriptors: (*Cardiovascular system, Shock), (*Stress (Physiology), Cardiovascular system), Heart, Blood circulation, Blood volume, Metabolism, Respiration, Burns, Infections, Oxygen consumption, Biochemistry, Acidosis.

Clinical and experimental observations indicate that only a very slight increase of cardiac output is requisite for maintenance of normal metabolism and uncomplicated recovery after a major operation. Patients with extensive sepsis or gangrene and experimental animals with induced abscesses must satisfy circulatory requirements more than double the basal value. Failure of the circulatory system to meet this demand results in acidosis and sudden death. Experiments indicate that an inflammatory area behaves in a fashion similar to an arterio-venous aneurysm. In experimental burns an increase of pulmonary vascular resistance and a decrease of compliance was found related to blood protein denaturation and red cell agglutination. Fever, water evaporation, and excess respiratory work also were demonstrated as contributing to increased circulatory demand. Observations of patients with respiratory complications indicate an efficient respirator is capable of reducing the cardiac output requirements by as much as 30% while improving the metabolic situation. (Author)

AD-436 047 Div. 16
OTS price $6.60

Harvard U. Medical School, Boston, Mass.
FACTORS AFFECTING THE SAFE USAGE OF THE PURINE RIBOSIDES IN THE PRESERVATION OF HUMAN RED CELLS (PART I); THE INFLUENCE OF POPULATION DISTRIBUTION ON THE METABOLISM AND VIABILITY OF THE ERYTHROCYTE (PART II).
Final rept. 1 Mar 55-0 June 58,
by John G. Gibson II. 1 Apr 64, 69p.
Contract DA49 007MD610
Unclassified report

Descriptors: (*Erythrocytes, Preservation), (*Metabolism, Erythrocytes), Blood, Viability, Additives, Biochemistry, Glucose, Transport properties, Storage, Phosphates, Survival, Anticoagulants, Labled substances, Radioactive isotopes, Blood transfusion, Uric acid, Aging (Physiology).

The effect of inosine added to ACD and CPD is an inhibition of glucose utilization accompanied by pentose breakdown with little change in lactate production. Ester phosphate is stabilized, but ion transport appears to be unaffected. Inosine breakdown is complete at 5 days of storage. In vivo studies in humans and rabbits show acceptable preservation of red cells up to 20 days of storage. Addition of inosine to ACD and CPD bloods at 14 and 21 days of prolongs the storage period to 20 days. There is a definite relationship to red cell age (by Fe59) and density (differential centrifugation), the youngest cells being the lightest. The uptake of Cr51 is determined by population distribution, being greatest in the youngest and progressively increasing with age. The extreme differential progressively on refrigerated storage. (Author)

AD-436 101 Div. 16, 14
OTS price $2.60

Baylor U., Coll. of Medicine, Houston, Tex.
ACRYLATE-AMIDE FOAM CARDIOVASCULAR PROSTHESES.
Final rept., 1 Jan 60-1 July 62,
by Richard W. Hardy. 1 July 62, 21p.
Contract DA49 193MD2110
Unclassified report

Descriptors: (*Prosthetics, Materials), (*Cardiovascular diseases, Surgery), (*Arteries, Prothestics), Elastomers, Surgical supplies, Thrombosis, Effectiveness, Permeability, Surgical techniques.

An evaluation of an open cell, foam acrylate-amide prosthetic material is presented. The preliminary work with this material was in the development of a new arterial prosthesis, a composite graft of woven dacron reinforced acrylate-amide foam. The arterial prosthesis is easily handled and the foam construction increases biological permeability while reducing the physical permeability, thus permitting rapid intimization without excessive bleeding. The success of the initial experimental work has led to a clinical trial in which 99 replacement, bypass, or patch-angioplasty procedures have been performed for disease of the carotid, vertebral, subclavian, renal, iliac, femoral, popliteal, and posterior tibial arteries as well as the thoracic and abdominal aorta. The use of a composite construction utilizing acrylate-amide foam is being evaluated in prostheses for mitral valve replacement, superior vena cava patch venoplasty, and esophageal replacement. (Author)

AD-436 104 Div. 16
OTS price $1.10

California U., Los Angeles.
AXONE REFLEXES AND INNERVATION OF CUTANEOUS EFFECTORS.
Final rept., 1 May 55-31 Dec 63,
by R. R. Sonnenschein. 23 Mar 64, 7p.
Contract Nonr23330, Proj. NR101 385
Unclassified report

Descriptors: (*Skin, Nerve cells), (*Nerve cells, Skin), (*Perspiration, Nerve cells), Reaction (Physiology), Diffusion, Antonomic nervous systems, Center nervous system, Histamine, Temperature, Sensory mechanisms, Cholinesterase inhibitors, Reflexes.

Objectives of the work are: (1) further testing of the hypothesis of axone reflex mechanisms, (2) elucidation of the mechanisms of initiation of cutaneous axone reflexes, (3) investigation of relationships between the peripheral phenomena and the central nervous system, (4) determination of the physiological significance of cutaneous axone reflexes, and (5) investigation of direct neuroeffector mechanisms involved in activation of cutaneous organs. (Author)

Division 16 - MEDICAL SCIENCES

AD-436 182 Div. 16
OTS price $1.60

Massachusetts Mental Health Center, Boston.
A RE-EXAMINATION OF THE CONCEPT OF ALPHA BLOCKADE IN ELECTROENCEPHALOGRAPHY,
by Alan D. Prince and Sanford J. Freedman.
1 Dec 61, 14p.
Grant AF AFOSR62 11
AFOSR TN2080 Unclassified report

Descriptors: (*Electroencephalography, Analysis), Stimulation, Brain, Light, Auditory nerve, Electrodes, Head.

AD-436 326 Div. 16
OTS price $9.10

Fordham Univ., New York.
SELECTED ABSTRACTS FROM SOVIET BIOMEDICAL JOURNALS. SERIES II, NO. 3,
by Robert Pollitzer. Nov 63, 110p.
Contract DA18 108 405CML867A
Unclassified report

Descriptors: (*Abstracts, Medicine), (*Diseases, Disease vectors), (*Reviews, Medical research), Public health, Ticks, Lice, Ecology, Pasteurella pestis, Antibiotics, Bacillus anthracis, Virus diseases, Vaccines, Rats, Mice.

AD-436 338 Div. 16, 7
OTS price $4.60

Melpar, Inc., Falls Church, Va.
BIOCHEMICAL FUEL CELL.
Quarterly progress rept. no. 6, 1 Oct-31 Dec 63,
by Paul S. May, G. C. Blanchard and R. T. Foley.
31 Dec 63, 44p.
Contract DA36 039sc90878, Task 1G6 22001A053 04
Unclassified report

Descriptors: (*Microorganisms, Metabolism), (*Fuel cells, Biochemistry), Hydrogen, Ultraviolet radiation, Clostridium welchii, pH, Production, Theory, Determination.

This report describes an experimental and theoretical investigation of hydrogen production by microorganisms. Screening studies on new strains of Clostridium welchii were conducted. Outstanding hydrogen evolution from freshly isolated strains was observed. Sixteen experiments with 10-liter-volume fermenters were conducted to examine the influence of pH, substrate concentration, inoculum concentration, and buffer concentration. The determining influence of pH was established and the results were used to set up a 1/2 (2) to the 5th power fractional factorial design. Initial mutation experiments on the production of high hydrogen-producing mutants by UV radiation were conducted. (Author)

AD-436 491 Div. 16
OTS price $1.60

Goteborg U. (Sweden).
BIOCHEMISTRY AND PHYSIOLOGY OF BRAIN DOPAMINE.
by Arvid Carlsson. 8 Feb 64, 13p.
Grant AF EOAR63 14
AFOSR 64 0737 Unclassified report

Descriptors: (*Hormones, Central nervous system), (*Central nervous system, Hormones), Metabolism, Nerve cells, Retina, Biochemistry, Pharmacology, Spinal cord, Brain, Fluorescence, Levarterenol, Amines, Amine oxidase, Chlorpromazine, Mental disorders.

Dopamine is a catecholamine, formerly known as an intermediate in the formation of noradrenaline and adrenaline. Recent studies indicate that it also serves a function of its own. It occurs in particularly high concentrations in certain parts of mammalian brain, e. g. the corpus striatum. It has become possible to localize dopamine at the cellular level by means of a histochemical technique. Dopamine has been shown to occur in neurons and probably serves as a transmitter. Dopamine occurs in different functional systems. In the retina it appears to be involved in the control of light sensitivity, and in the median eminence in the control of anterior pituitary secretions. In the corpus striatum and certain parts of the brain stem it appears to function at a high level of integration and may play an important role in the syndromes induced by e. g. reserpine and chlorpromazine, both of which interfere with dopamine metabolism. (Author)

AD-436 525 Div. 16
OTS price $2.60

Instituto de Investigaciones Cerebrales, Mexico City (Mexico).
SLEEP INDUCING MECHANISMS.
Final technical rept.,
by Raul Hernandez-Peon. Mar 64, 27p.
Grant AF AFOSR62 364
AFOSR 64 0735 Unclassified report

Descriptors: (*Sleep, Anatomy), (*Brain, Sleep), Cats, Acetylcholine, Stimulation, Atropine, Electroencephalography, Behavior, Cerebrum, Cerebral cortex, Attention, Inhibition, Neurology, Cannulation, Electrodes, Levarterenol, Indole alkaloids, Histology, Genetics, Cerebellum, Biochemistry, Reaction (Physiology), Physiology, Hypnotics and sedatives.

The behavioral and electrographic effects produced by the intracerebral application of minute crystals of various chemical substances were studied in cats with descending cannulae permanently implanted in their brains. An extensive exploration was made from the most rostral part of the forebrain to caudal parts of the hindbrain. It was found that acetylcholine alone, or plus eserine, and carbachol elicited the two stages of sleep when applied to any point of a highly circumscribed anatomical pathway. This pathway extends from the basolateral part of the rostral forebrain through the region of the olfactory tubercle, to the upper medial preoptic region involving the medial forebrain bundle through the lateral and posteromedial hypothalamus, passing in the ventromedial part of the midbrain through Bechterew's and Gudden's nuclei. Hypnogenic points were also found in the medulla oblongata, in the cerebellar lingula, and in the pyriform lobe. (Author)

AD-436 551 Div. 16
OTS price $1.60

Nara Medical Coll. (Japan).
ELECTRON MICROSCOPE STUDY ON THE INFECTIOUS HEPATITIS.
Final rept. no. 1, 15 Feb 63-14 Feb 64,
by Gonpachiro Yasuzumi. 14 Feb 64, 15p.
Contract DA92 557FEC36513
Unclassified report

Descriptors: (*Hepatitis viruses, Infections), Electron microscopy, Cells (Biology), Cytoplasm, Kidneys, Liver, Ferritin, Histology, Tissues (Biology).

Biopsy materials from human liver in cases of chronic infectious hepatitis were studied in thin sections with the electron microscope. The

study disclosed several alterations of cell organelles produced by certain agent of infectious hepatitis. The dense cytoplasmic particles 230± 30 A in diameter were found in the parenchymal cells containing inclusions which were composed of ferritin molecules. (Author)

AD-436 552 Div. 16
OTS price $1.60

Nara Medical Coll. (Japan).
ANALYSIS OF THE DEVELOPMENT OF JAPANESE B ENCEPHALITIS VIRUS WITH THE ELECTRON MICROSCOPE.
Rept. no. 1, Final, 15 Feb 63-14 Feb 64,
by Gonpachiro Yasuzumi. 14 Feb 64, 18p.
Contract DA92 557FEC36512
Unclassified report

Descriptors: (*Japanese B encephalitis virus, Analysis), Electron microscopy, Thalamus, Mice, Infections, Cytoplasm, Nuclei (Biology), Histology, Histological techniques.

Microglia in the hypothalamus and thalamus of mice infected with the JBE virus have been observed in the electron microscope. The microglia have been revealed to have dense particles with an averaging diameter of 375 A in the nuclei and cytoplasm when the paralysis has occurred in the mouse inoculated intracebrally with the JBE agent. In view of the fact that the particles have a distinctive morphology and have never been encountered in uninfected cells and in the cells at the early stage of the infection, they are believed to be JBE viral particles. The viral particles arrayed in a crystalline form show the fine dot or thread-like elements as their nucleoid structure. Development of the virus particles occurs in the nucleus rather than the cytoplasm of infected cells. A possible relationship between dense particles appearing within the nuclei and viral particles has been discussed. (Author)

AD-436 553 Div. 16
OTS price $6.60

Kumamoto Univ. Medical School (Japan).
THE BIOLOGICAL SIGNIFICANCE AND CHEMISTRY OF A PROTEASE INHIBITOR NEWLY ISOLATED FROM ANIMAL TISSUES.
Rept. no. 2, Final, 1 Feb 63-31 Jan 64
by Hideo Hayashi. 31 Jan 64, 67p.
Contract DA92 557FEC35779
Unclassified report

Descriptors: (*Enzymes, Inhibition), (*Histamine, Biosynthesis), (*Biochemistry, Proteins), Purification, Skin, Chromatographic analysis, Tissue extracts, Molecular properties, Antigen-antibody reactions, Permeability, Tissue culture, Cells (Biology).

A specific protease inhibitor of polypeptide nature is isolated from the healing Arthus skin site and highly purified as a fibrous substance by means of chromatography; it behaves as a homologous substance electrophoretically and in ultracentrifugation. Its iso-electric point is around 6.6 and its sedimentation coefficient is 1.21 S. It inactivates the SH protease responsible for the Arthus skin lesion and papain, but has no effect on trypsin and chymotrypsin. Biological significance of the inhibitor is being studied. Anaphylactic release of two different permeability factors is found in cultured cells, in parallel with the morphological response; histamine being released before our new permeability factor. The release of histamine is possibly concerned with the intracellular SH protease which is inactivated by the above inhibitor. (Author)

AD-436 554 Div. 16
OTS price $3.60

Sapporo Medical Coll., Hokkaido (Japan).
GENETIC, SEROLOGIC, AND BIOCHEMICAL STUDIES ON VIRAL INFECTION AND LYSOGENIZATION.
Rept. no. 2, Final, 20 Jan 63-19 Jan 64,
by Hisao Uetake. 19 Jan 64, 34p.
Contract DA92 557FEC35775
Unclassified report

Descriptors: (*Bacteriophages, Salmonella), Growth, Inhibition, Mutations, Radioactive isotopes, Phosphorus, Genetics, Desoxyribonucleic acids, Antigens and antibodies, Tracer studies, Biochemistry, Infections, Japan.

Salmonella phage undergoes a two-way host-controlled viriation as described before. Besides multiplicity activation (MA), a thermo-labile factor responsible for phage growth restriction was found. Experiments with P32-labled phages show that the DNA of the restricted phage is degraded rapidly after injection of the nonpermissive host, and that the degradation is prevented by heating the cells prior to infection. MA-responsible, thermolabile, and DNA-destroying factors are suggested to be identical. Chemical, serological, and genetic studies have revealed the followings: Salmonella senftenberg 87Aa' with O antigen 3 alone has alpha-galactosyl-mannosyl-rhamnose as serological determinant; specificity 3 is determined by mannosyl-rhamnose; another cross reaction between E1 strains and 87Aa' is attributed to alpha-galactosyl structure; 87Aa' is suspected to carry defective prophage lacking conversion genes. (Author)

AD-436 589 Div. 16
OTS price $1.10

Army Biological Labs., Frederick, Md.
LIPOLYTIC ACTIVITY OF SOME PATHOGENIC MICROBES,
by V. I. Rykova and I. V. Domaradskiy, tr. by Charles T. Ostertag, Jr. Aug 63, 7p.
ABL T876 Unclassified report

Trans. from J. Microbio., Epidemiol. and Immunobiol., Vol. 5, pp. 14-17, 1963.

Descriptors: (*Microorganisms, Pathology), USSR, Epidemiology, Immunology, Brucella suis, Brucella abortus, Brucella, Pseudomonas, Bacillus anthracis, Rodents, PH, Enzymes.

AD-436 705 Div. 16
OTS price $1.60

Harry Diamond Labs., Washington, D. C.
PROTECTION OF THE HUMAN EYE FROM LASER RADIATION,
by Harald W. Straub. 10 July 63, 11p.
HDL Proj. A0200
HDL TR1153 Unclassified report

An expanded version is available to U. S. Military Organizations as AD-415 740L.

Descriptors: (*Eye, Safety), (*Laser, Radiation effects), (*Blindness, Lasers), Optical filters, Dielectrics, Rabbits, Retina, Ruby.

Various possibilities for protecting the human eye from blinding through laser radiation have been considered. Of the investigated selectively absorptive and/or selectively reflective (dielectric) optical filters, some have to be disregarded for a variety of reasons. The Schott BG-18 type filter glass, in a thickness of approximately 4.3 mm, appears to provide adequate protection in the low and medium energy pulse range and in a spectral range between 0.69 and 1.2 microns, covering the ruby as well as the Nd-doped

glass and Ca WO4 lasers. The calculations are based on the assumption of equality of the burn sensitivities of the human and of the rabbit retina. (Author)

AD-436 723 Div. 16
OTS price $5.60

Federation of American Societies for Experimental Biology, Washington, D. C.
A STUDY OF THE RATIONALE AND TECHNIQUES FOR LONG-RANGE TECHNOLOGICAL FORECASTING IN THE BIOLOGICAL AND MEDICAL SCIENCES,
by Wendell H. Griffith. 15 Mar 64, 55p.
Contract DA49 092AR09
Unclassified report

Descriptors: (*Medical research, Research program administration), Biology, Scientific research, Military medicine, Theory, Operations research.

Forecasts are potential aids in the planning of future technological environments. Their usefulness depends on their validity. Accurate deductions are essential regarding anticipated responsiveness to existing and expected opportunities for achievements in selected areas of science and technology. This is a review of the multiple forces that determine the reliability of such deductions or predictions. (Author)

AD-436 793 Div. 16
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRONIC DIFFERENTIATING DEVICES FOR ANALYSIS OF PHYSIOLOGICAL PROCESSES,
by Ye. B. Babskiy, V. L. Karpman, G. M. Petrov and A. I. Skachkova. 23 Mar 64, 11p.
FTD TT63 1191 Unclassified report

Trans. from Elektronika v Meditsine, pp. 71-78, 1960.

Descriptors: (*Physiology, Differentiating circuits), (*Muscles, Measurement), Analysis, Electronics, Electroencephalography, Voltage, Amplifiers, Ballistocardiography.

AD-436 794 Div. 16
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ABOUT MICROORGANISMS IN PERMAFROST,
by A. Ye Kriss. 10 Feb 64, 16p.
FTD TT63 929 Unclassified report

Trans. from Mikrobiologiya, 9, 9-10, pp. 879-887, 1940.

Descriptors: (*Permafrost, Microorganisms), (*Microorganisms, Permafrost), (*Microorganisms, Detection), Preservation, Identification, Sampling, Viability, Ice.

AD-436 798 Div. 16
OTS price $2.60

Army Biological Labs., Frederick, Md.
BIOCHEMICAL CLASSIFICATION OF PIRICULARIA FUNGI - PRODUCERS OF PHYSIOLOGICALLY ACTIVE SUBSTANCES,
by V. I. Kefeli, tr. by Charles T. Ostertag, Jr.
Aug 63, 21p.
ABL T879 Unclassified report

Trans. from Botanical Jnl., 47:9, pp. 1318-1326, 1962.

Descriptors: (*Classification, Piricularia), (*Fungi, Classification), Biochemistry, Nutrition, Nitrogen, Growth, Culture media, Ph, Biosynthesis, Thiamines.

AD-436 799 Div. 16
OTS price $1.10

Army Biological Labs., Frederick, Md.
THE LAG PHASE AND OXIDATION-REDUCTION POTENTIAL IN CULTURES OF ANAEROBES,
by I. L. Rabotnova and N. A. Pryanishnikova, tr. by Charles T. Ostertag, Jr. July 63, 10p.
ABL T841 Unclassified report

Trans. from Microbiology, 24:6, pp. 671-676, 1955.

Descriptors: (*Bacteria, Life cycle), (*Oxidation-reduction reactions, Bacteria), Phase studies, Growth, Inhibition, Reproduction (Physiology), Culture media, Biochemistry, Biosynthesis.

AD-436 800 Div. 16
OTS price $1.60

Army Biological Labs., Frederick, Md.
DETECTION OF ANTIGENS WITH THE HELP OF FLUORESCENT ANTIBODIES,
by V. Ya. Shevlyagin, tr. by Charles T. Ostertag, Jr. Aug 62, 17p.
ABL T852 Unclassified report

Trans. from Successes of Modern Biology, 45:2, pp. 218-233, 1958.

Descriptors: (*Antigens and antibodies, Detection), Microorganisms, Immunology, Immune serums, Labeled substances, Microscopy, Biological stains, Tissues (Biology), Viruses, Medical research.

AD-436 801 Div. 16
OTS price $1.60

Army Biological Labs., Frederick, Md.
MORE IN RELATION TO THE PROBLEM OF SPECIES AND SPECIES FORMATION IN MICROBIOLOGY,
by N. N. Zhukov-Verezhnikov, I. N. Mayskiy and L. A. Kalinichenko, tr. by Charles T. Ostertag, Jr. Sep 63, 14p.
ABL T880 Unclassified report

Trans. from Advances of Contemporary Biology, 39:2, pp. 245-252, 1955.

Descriptors: (*Microorganisms, Classification), (*Classification, Microorganisms), Metabolism, Immunology, Culture media, Bacteriophages, Transformations, Mutations.

AD-436 840 Div. 16
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOME PROBLEMS OF RECORDING HEART SOUNDS,
by A. I. Koblents-Midshke. 23 Mar 64, 15p.
FTD TT63 1193 Unclassified report

Trans. from Elektronika V Meditsine,

Gosenergoizdat, Moskva-Leningrad, pp. 110-119, 1960.

Descriptors: (*Heart, Cardiography), (*Heart, sounds), Sounds, Cardiography, USSR, Diagnosis, Frequency, Attenuation, Analysis, Electrocardiography, Intensity, Electronic recording systems.

AD-436 890 Div. 16
OTS price $1.10

IIT Research Inst., Chicago, Ill.
DEVELOPMENT OF AN ORALLY EFFECTIVE INSECT REPELLENT.
Quarterly progress rept., 1 Feb-30 Apr 64,
by Harbans Lai. 30 Apr 64, 8p. Rept. no C2228
Contract DA49 193MD2281, IITRI Proj. C222
Unclassified report

Descriptors: (*Insect repellants, Effectiveness), Tests, Blood, Culicidae, Cyclohexanes, Cyclohexenes, Glycols, Esters, Ethers, Alcohols, Amides, Organic nitrogen compounds, Cyclopentanes, Carboxylic acids, O-heterocyclic compounds, Aromatic compounds, Anilines.

AD-437 117 Div. 16
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AN ELECTROENCEPHALOSCOPE WITH DUAL COMMUTATION,
by V. M. Anan'yev. 23 Mar 64, 13p.
FTD TT63 1190 Unclassified report

Trans. from Elektronika V Meditsine, Gosenergoizdat, Moskva-Leningrad, pp. 62-70, 1960.

Descriptors: (*Electroencephalography, Display systems), (*Electronic recording systems, Design), Electronic commutators, Beam power tubes, Electronic scanners, Circuits, Medical equipment.

AD-437 118 Div. 16
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CONTEMPORARY RADIO ELECTRONICS AND PROBLEMS OF MEDICINE AND BIOLOGY,
by V. G. Marvrodiadi and I. T. Akulinichev.
23 Mar 64, 18p.
FTD TT63 1188 Unclassified report

Trans. from Elektronika V Meditsine, Gosenergizdat, Moskva-Leningrad, pp. 38-50, 1960.

Descriptors: (*Electronic recording systems, Medical research), (*Medical research, Electronic recording systems), (*Measuring devices, Biology), Design, USSR, Medical equipment, Effectiveness, Radiotherapy, Electrical properties, Prosthetics, Diagnosis.

AD-437 195 Div. 16
OTS price $1.60

Kent State Univ., Ohio.
THE EFFECT OF ETHANOL ON PHYSICAL PERFORMANCE IN MICE.
Progress rept.,
by Charles G. Wilber and Herbert Payne. Jan 64, 15p.
Contract DA49 193md2216
Unclassified report

Descriptors: (*Ethanols, Metabolism), (*Swimming, Physiology), (*Adrenal cortex hormones, Biosynthesis), Mice, Physical fitness, Exercise, Fatigue (Physiology).

Mice were forced to swim to exhaustion after administration of various doses of 10% ethanol intraperitoneally. Doses of 0.0 ml/mouse (controls) up to 1.2 ml/mouse were given. At a dose of about 0.7 ml/mouse, swimming time was significantly increased over controls. Doses of 1 ml/mouse or more depressed swimming time to virtually zero. The results are presented as an example of hormoligosis. (Author)

AD-437 504 Div. 16
OTS price $1.60

Mt. Sinai Hospital, New York.
HISTOPATHOLOGY OF GERMFREE ANIMALS,
Annual rept. 1 May 63-29 Feb 64,
by Heinz Bauer, Albert Einheber, Richard E. Horowitz, Fiorenzo Paronetto and Willard A. Burns. 29 Feb 64, 13p.
Grant DA MD 49 1936G24
Unclassified report

Descriptors: (*Germ-free animals, Histology), Immunology, Auto radiography, Electrophoresis, Radiation effects, Whole body irradiation, Tissues (Biology), Gamma globulin, Lymphatic system, Thymus, Mice, Morphology (Biology), Pathology.

In close collaboration with the Department of Germfree Research, WRAIR, Washington, quantitative, histologic, immunocytochemical, autoadiographic, and electrophoretic studies were performed in normal and irradiated germfree and conventional mice. One third of conventional but no germfree mice were killed by 550 r whole body irradiation. Before radiation, germfree mice had fewer immunologically active cells in lymphatic tissue and a lower serum gamma globulin than conventional animals. After radiation, a pronounced immune response developed in the lymph nodes and spleens of all survivors, associated with a rise in serum gamma globulin in the germfree but a drop in the conventional mice. Gamma globulin decreased after low-lethal doses of irradiation in several mammalian species and this was attributed to leakage from radiation-damaged intestine. In germfree mice no such loss occurs which indicates that bacteria rather than radiation alone are responsible for this depletion. The thymus of germfree mice is smaller and produces fewer cells than its conventional counterpart. Thymus morphology and cell turnover thus correlate directly with immunologic activity which is low in germfree and high in conventional mice. After radiation, the thymus and lymphatic tissue of germfree and conventional animals recover equally well. (Author)

AD-437 510 Div. 16
OTS price $1.10

Bionetics Research Labs., Inc., Falls Church, Va.
NEW METHODS DEVELOPMENT FOR IRRITANT SCREENING.
Quarterly progress rept. no. 4, 23 Dec 63-22 Mar 64,
by E. Ross Hart. 15 Apr 64, 10p.
Contract DA18 108AMC119A
Unclassified report

Descriptors: (*Irritating agents, Tests), Laboratory animals, Cats, Monkeys, Histamine.

Histamine liberation appears of questionable value for prediction of irritant potency. The effects of irritants on excised tissue are being studied. A survey of suitable test species (cats, Rhesus monkeys and African green monkeys) is in progress. Screening of new compounds has been slowed due to difficulties with the quality of animal supplt; approximately 330 compounds have been studied. (Author)

Division 16 - MEDICAL SCIENCES

AD-437 605 Div. 16
OTS price $3.60

Miami Univ., Coral Gables, Fla. School of Medicine.
STUDIES OF ABSORPTION-TRANSPORT MECHANISMS IN THE SMALL INTESTINE.
Annual progress rept., 1 Aug 63-31 July 64,
by Arthur S. Nunn, Jr. 31 July 64, 35p.
Contract DA49 193md2415
Unclassified report

Descriptors: (*Intestines, Absorption (Biological)), Glucose, Transferases, Phosphorylation, Oxygen, Glycolysis, Adenosine phosphates, Reduction (Chemistry), Sodium, Tissues (Biology), Membranes (Biology).

Studies concerning the mechanisms of intestinal glucose absorption indicate that the monophosphoesterases are not distributed along the intestinal length in a pattern which would directly involve them in the absorption process. The kinetics of these phosphatases indicate support for the concept that phosphorylation of glucose is not involved in its transport across the mucosa. The oxygen utilization by in vitro intestinal segments during glucose transport indicates a dependency upon glycolytic pathways for the increased energy requirements. Indirect evidence of non-oxidative phosphorylation of ADP to ATP has been presented and has been postulated as the possible rate limiting step in the transport scheme. Ouabain, at concentrations selected to interfere selectively with the sodium pump, reduces glucose absorption but does not alter the oxidative requirements of the absorbing in vitro preparation. (Author)

AD-437 645 Div. 16
OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
CONTROLLED CONTAMINATION: A PRACTICAL APPROACH FOR DEVELOPING STERILIZATION PROCEDURES FOR SEALED COMPONENTS OF SPACECRAFT,
by Joseph T. Cordaro, Henry Buchanan, Bruce Mann and A. K. Miller. Sep 63, 10p.
Task 775302
SAM TDR63 73 Unclassified report

Descriptors: (*Spacecraft cabins, Contamination), Purification, Determination, Temperative, Spores, Microorganisms, Heat Instrumentation, Manufacturing methods.

Deliberate contamination of components during manufacture appears both practical and feasible for developing sterilization procedures for spacecraft components. Thus, it is possible to determine whether normal manufacturing procedures are sufficient to sterilize or whether the sterlization procedures required (e.g., temperature-time intervals for dry heat) to sterlize can be accomplished without component damage. Mehtods are presented for controlled contamination with bacterial spores highly resistant to dry heat and bacteriologic recovery of such spores. Impregnated (e.g., with polybutylene) capacitors were rendered sterile during manufacture; nonimpregnated capacitors were not.. Any damaging effects of heat sterilization might be increased if the components were subjected to further heating when installed in circuits of spacecraft instrumentations. (Author)

AD-437 648 Div. 16
OTS price $8.10

Naval Training Device Center, Port Washington, New York.
INTERNAL ENVIRONMENTAL SIMULATOR FOR A MAN-MACHINE SYSTEM,
by J. D. Zeff, T. R. Charanian, D. A. Davidson, R. B. Neveril and C. M. Tomsic. Sep 63, 83p.
Contract N61339 786
NTDC TR786 2 Unclassified report

Descriptors: (*Flight simulator, Life support), (*Life support, Flight simulators), Maintenance, Control, Performance (Engineering), Oxygen, Regeneration, Design, Recovery, Water, Ecology, Closed ecological systems.

Control, maintenance, repair and performance requirements for advanced life-support systems were investigated by laboratory evaluations of experimental water recovery, oxygen regeneration, and cabin gas conditioning models. This report (1) reviews the design criteria (established in the preceeding Study Phase Report), (2) describes the system operation and test procedures, (3) discusses the test ressults, and (4) lists recommendations for an advanced, integrated life-support system. (Author)

AD-437 778 Div. 16,28
OTS price $5.60

Harvard Univ., Boston, Mass. Medical School.
A STUDY OF SOME RELATIONSHIPS BETWEEN REINFORCEMENT AND PHYSIOLOGICAL RESPONSES,
by Mona Morningstar and David Shapiro. Feb 64, 56p. Rept. no. TR9
Contract Nonr186643
Unclassified report

Report on Group Process Under Different Conditions of Success and Failure. Master's thesis.

Descriptors: (*Autonomic nervous system, Behavior), (*Physiology, Measurement), (*Motivation, Motor reaction), Muscles, Tables, Galvanic skin response, Stimulation, Electro Enchephalography, Test methods, Probability, Social communication, Mathematical analysis.

AD-437 863 Div. 16
OTS price $1.60

Florida U., Gainesville.
EFFECTS OF THE COMPRESSIBILITY OF ALVEOLAR GAS ON THE DYNAMICS AND WORK OF BREATHING,
by M. J. Jaeger and A. B. Otis. Oct 63, 19p.
Contract AF41 609 1553, Task 775801
SAM TDR63 71 Unclassified report

Descriptors: (*Respiration, Physiology), (*Compressed air, Lungs), Pressure, Volume, Models (Simulations), Mathematical analysis, Ventilation, Gas flow.

Alveolar gas is compressed and expanded during every breathing cycle. The volume displacement measured at the mouth Vt (tidal volume) is therefore smaller than the volume displacement of the lung Vt that may be measured with a body plethysmograph. Experimental data found in normal subjects and in patients with obstructive emphysema confirm the theory that the ratio Vt/Vt decreases with increasing airway resistance, frequency, and lung volume. There was little effect in normal subjects breathing at different breathing rates; however, in patients with obstructive emphysema it may be appreciable. With increasing altitude the effect is expected to be more pronounced. The mechanical work performed in compressing and expanding alveolar gas may be determined by recording the volume displacement of the lung simultaneously with tidal volume and intraesophageal pressure. Normally, work related to compressibility is insignificant, but in patients with obstructive emphysema, it becomes appreciable during hyperpnea. The compressibility of alveolar gas was also found to increase the negative work performed by respiratory muscles. (Author)

17. METALLURGY

AD-435 148 Div. 17
OTS price $13.00

General Telephone and Electronics Labs., Inc., Bayside, N.Y.
EXPERIMENTAL STUDY OF FACTORS CONTROLLING THE EFFECTIVENESS OF HIGH-TEMPERATURE PROTECTIVE COATINGS FOR TUNGSTEN.
Summary rept. 15 May 62-15 June 63,
by C. D. Dickinson and L. L. Seigle. 15 July 63, 185p. Rept. no. TR63 641 12
Contract AF33 657 8787, Proj. 7312, Task 731201
ASD TDR63 744 Unclassified report

Descriptors: (*Tungsten, Refractory coatings), (*Refractory coatings, Tungsten), (*Refractory metals and alloys, Refractory coatings), Zirconium alloys, Thorium alloys, Yttrium alloys, Hafnium alloys, Tungsten alloys, Rhenium alloys, Aluminum alloys, Chromium alloys, Tin alloys, Lanthanum alloys, Zirconium compounds, Hafnium compounds, Rhenium compounds, Tungsten compounds, Thorium compounds, Oxides, Nitrides, Oxidation, Oxidation inhibition, Diffusion, Oxygen, Scale, Phase studies, Microstructure.

Oxidation at elevated temperatures of Zr-Th, Zr-Y, Hf-Y, Hf-W, Hf-W-Re, Al-Cr-Sn, and Al-La-Sn alloys, as well as ZrN, HfN and ZrN-ThN combinations was studied in order to clarify specific aspects of the problem of protecting W against oxidation at high temperatures. Experimental results showed that there was much less tendency for ZrO2, ThO2 and HfO2 scales to crack during growth at high than at low temperatures. Multiphased scales were more resistanct to spalling than single-phased scales, and protective oxides were grown many alloys. However, even in sound and coherent scales composed of these oxides, O diffused so rapidly that it is doubtful that they could form the basis of a protective system at 2000 C. (Author)

AD-435 151 Div. 17, 25
OTS price $8.10

Pitman-Dunn Inst. for Research, Army Frankford Arsenal, Philadelphia, Pa.
RESEARCH CONDUCTED ON SECRETARY OF ARMY RESEARCH AND STUDY FELLOWSHIP IN THE FIELD OF TRANSMISSION ELECTRON MICROSCOPY,
by Edwin R. Levin. Jan 64, 86p.
DA Proj. 599 01 004
PDIR R 1706 Unclassified report

Descriptors: (*Electron microscopes, Metallurgy), (*Crystallography, Electron microscopes), Refractory metals, Crystal lattice defects, Niobium, Tantalum, Crystal structure, Fatigue (Mechanics), Theory, Plasticity, Solid state physics.

A detailed study was made of prismatic dislocation loops in the bcc refractory metals Nb and Ta. It was found that appreciable densities of dislocation loops can be created in these metals by fatigue deformation. The kinetics of annealing of the loops was studied, and it was found that in both metals the loops anneal out with appreciable time rates at temperatures above 700 C. Form the data, the activation energy for self-diffusion could be obtained, and values of approxi 3 e.v. ± 15% were derived for both Nb and Ta. However, since no direct observation could be made of the actual annealing process, there is some question as to the exact mechanism involved. A mechanism of conservative climb may be responsible, rather that the assumed volume self-diffusion by vacancy migration. (Author)

AD-435 497 Div. 17
OTS price $1.60

Foreign Technology Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE APPLICATION OF THE THEORY OF TRUE-STRESS CURVES TO VARIOUS TEMPERATURE CONDITIONS OF DEFORMATION,
by V. Ya. Shekhter. 31 Dec 63, 17p.
FTD TT63 768 Unclassified report

Trans. from Protsessy Shtampovki i Ikh Tekhnologicheskiye Parametry, Moskovskiy avtomekhanicheskiy institut, pp. 146-154, 1959.

Descriptors: (*Metals, Stresses), (*Stresses, Metals), Deformation, Theory), Temperature, Equations, Tensile properties, Hardness, Heat treatment, Elasticity, USSR, Analysis, Experimental data, High temperature research, Low temperature research.

At the present time the theory of true-stress curves is used only for cold deformation. The possibility of extending this theory to hot and intermediate forms of deformation is discussed in this report. (Author)

AD-435 560 Div. 17, 25
OTS price $.50

Naval Research Lab., Washington, D.C.
AN INVESTIGATION OF THE ROTATING-BEAM TEST FOR LOW-CYCLE FATIGUE CRACK PROPAGATION STUDIES,
by E. A. Lange, T. W. Crooker and R. E. Morey.
17 Mar 64, 15p.
Proj. RR007 01 46 5420
NRL 6056 Unclassified report

Descriptors: (*Fatigue (Mechanics), Test methods), (*Test equipment, Fatigue (Mechanics)), Failure (Mechanics), Fracture (Mechanics), Propagation, Steel, Tensile properties, Heat treatment, Stresses, Plasticity, Deformation, Strain (Mechanics), Ductility, Transition temperature, Brittleness, Toughness.

A method is described for investigating the low-cycle fatigue behavior of high-strength, notch-tough materials using standard rotating beam fatigue machines. The method includes the application of tensile tests on partially fatigued specimens to obtain notch tensile-strength and crack depth information. An analysis based on experimental data from HY-80 steel specimens of three sizes and three heat-treatments is presented. Crack depth and crack propagation rate are employed as parameters in the analysis. (Author)

AD-435 675 Div. 17, 25
OTS price $.75

Research And Technology Div., Air Force Systems Command, Washington, D.C.
SLIDING FRICTION OF COPPER.
Rept. for May 62-Aug 63,
by Tung Liu. Mar 64, 28p.
Proj. 7342, Task 734204
RTD TDR63 4257 Unclassified report

Descriptors: (*Copper, Friction), (*Friction, Test equipment), Loading (Mechanics), Surface properties, Adhesion, Plasticity, Deformation, Theory.

To satisfy future Air Force requirements, the present knowledge on the sliding friction and wear was reviewed and found to be inadequate. More experimental data with better controlled environmental conditions are needed. To fulfill

this need, a versatile sliding friction apparatus has been designed, constructed, and tested. As the initial phase of the work, friction between copper specimens were investigated. (Author)

AD-435 698 Div. 17
OTS price $5.60

Titanium Metals Corp. of America, New York.
DEVELOPMENT OF A STABLE-BETA TITANIUM ALLOY.
Quarterly rept. no. 5, 1 July-30 Sep 63,
by D. B. Hunter. 30 Sep 63, 51p.
Contract DA30 06903D3743
WAL TR405 2 4 Unclassified report

Descriptors: (*Titanium alloys, Manufacturing methods), (*Alloys, Titanium alloys), Aluminum alloys, Chromium alloys, Copper alloys, Cobalt alloys, Iron alloys, Manganese alloys, Molybdenum alloys, Vanadium alloys, Tensile properties, Ductility, Brittleness, Hardness, Silicon alloys, Dispersion hardening, Heat treatment.

Tensile and bend tests were performed on the three base alloys, Ti-17V-10Cr-3A1, Ti-8Mo-8V-7.5Fe-3A1 and Ti-15Mo-5Fe-3A1, containing additions of up to 5% Cu, Ni and Co. Complete replacement of Cr of Fe by Cu in the base alloys resulted in brittleness upon aging at 900F. Addition of up to 1% Si to Ti-17V-10Cr-3A1 increased tensile strength but lowered ductility after aging. Investigation of two metastable beta alloys was undertaken in the compositional range Ti-17V-(1.5 to 4)Fe-3A1 and Ti-8Mo-8V-(1 to 3)Fe-3A1 by hardness and tensile tests, and of two compositional ranges of stable non-hardening beta alloys, Ti-17V-(10 to 12)Mn-3A1 and Ti-8Mo-8V-(6 to 7)Fe-3A1, by tensile, bend and impact tests. These indicated that Ti-17V-4Fe-3A1 and Ti-8Mo-8V-1Fe-3A1 were the better metastable beta alloys, and Ti-17V-11Mn-3A1 and Ti-8Mo-8V-6Fe3A1 the preferable stable alloys. (Author)

AD-435 779 Div. 17.
OTS price $10.10

Columbia U. School of Engineering, New York.
STUDY ON YIELDING OF IRON,
by Eun U. Lee. Feb 64, 122p. Rept. no. TR4
Contract Nonr26661
Unclassified report

Doctoral Thesis.

Descriptors: (*Iron, Mechanical properties), (*Quenching (Cooling), Temperature), Carbon, Tensile properties, Grain structures (Metallurgy), Internal friction, Grain boundaries, Theory, Aging (Materials), Strain (Mechanics), Solubility, Solid solutions, Crystal lattice defects, Heat treatment.

The effect of quenching on the yield stress of iron was studied at extremely small carbon concentrations. Swedish iron wire specimens of various grain sizes were decarburized until they showed no yield point or strain-aging (70 hours of wet-hydrogen treatment at 716 C). Afterwards they were recarburized in an atmosphere of normal heptane and dry-hydrogen at 716 C and quenched from various temperatures, ranging from 130 to 730 C, into room-temperature water, and tensile tested. Carbon contents were measured by the internal friction technique. (Author)

AD-435 780 Div. 17
OTS price $11.00

Columbia Univ. School of Engineering and Applied Science, New York.
MEGACYCLE DAMPING AND THE ELASTIC STIFFNESS COEFFICIENTS OF SINGLE CRYSTAL AND POLYCRYSTALLINE ARMCO IRON FROM ROOM TEMPERATURE TO 400 C,
by Arthur E. Lord, Jr. Feb 64, 147p. Technical rept. no. 5
Contract Nonr26661
Unclassified report

Doctoral thesis.

Descriptors: (*Iron, Mechanical properties), (*Carbon, Diffusion), Solubility, Internal friction, Nitrogen, Theory, Single crystals, Metallic crystals, Damping, Magnetic properties, Heat of activation.

The megacycle, pulse-echo internal friction method has been used to measure carbon and nitrogen Snoek damping peaks in alpha-iron in the temperature range 300 to 400 C. The diffusion coefficient of nitrogen at 326 C so determined was in good agreement with the coefficient determined by a bulk desorption method. (Author)

AD-435 840 Div. 17
OTS price $1.10

RIAS, Inc., Baltimore, Md.
THE EFFECT OF DEFORMATION AND RECOVERY ON THE SUBSEQUENT RESISTIVITY INCREASE IN COLD-WORKED CADMIUM,
by H. R. Peiffer. 1963, 7p. TR7
Contract Nonr3707 00
Unclassified report

Descriptors: (*Cadmium, Cold working), (*Resistance (Electrical), Cadmium), Deformation, Crystal lattice defects, Gyrogenics.

Recent experiments on the recovery spectrum of deformed pure and doped cadmium have yielded an opportunity for performing experiments on this hexagonal metal. It is the purpose of this manuscript to describe these results and present reasons why cadmium behaves differently than copper. (Author)

AD-435 863 Div. 17, 4
OTS price $.50

Air Force Materials Lab., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A PLASMA ARC TECHNIQUE FOR THE SPECTROCHEMICAL DETERMINATION OF TITANIUM AND ZIRCONIUM IN MOLYBDENUM,.
Rept. Sep-Dec 63,
by James H. Muntz. Mar 64, 14p.
Proj. 7360, Task 736005
ML TDR64 36 Unclassified report

Report on The Chemistry and Physics of Materials.

Descriptors: (*Molybdenum alloys, Chemical analysis), (*Titanium, Chemical analysis), (*Zirconium, Chemical analysis), Zirconium alloys, Plasma jets, Excitation, Line spectrum, Hydrogen peroxide, Sulfuric acid, Titanium alloys.

A plasma arc technique has been developed for the spectrochemical determination of titanium and zirconium in molybdenum alloys. Titanium is determined in the 0.25 to 1.5 percent range and zirconium in the 0.05 to 0.4 percent range with an overall precision of about ±5 percent and an accuracy which approaches the precision. Sensitivity for the zirconium determination is achieved by using high gas flow and high amperage. Molybdenum is used as the internal standard and a background correction is necessary to produce a straight line analytical curve for zirconium over the concentration range of interest. (Author)

AD-436 322 Div. 17, 12, 26, 25
OTS price $4.60

General Dynamics/Fort Worth, Tex.
HEAT TRANSFER IN HONEYCOMB SANDWICH PANELS,
by J. V. Clifton. 1 Nov 61, 50p. Rept. no. ERR FW 104
Contract AF33 657 11214
Unclassified report

Descriptors: (*Sandwich panels, Heat transfer), (*Honeycomb cores, Sandwich panels), Silver alloys, Brazing, Bonding, Manufacturing methods, Steel, Titanium, Aluminum, Panels (Structural), Airplane panels, Thermal conduction, Thermal insulation, Glass textiles, Model tests, Mathematical analysis, Configuration, Design, Phenolic plastics, Silver solders.

Accurate analytical methods are presented for predicting the heat transfer and resulting temperature distribution in both brazed and bonded honeycomb sandwich panels during transient and steady state conditions. This analysis includes the heat transfer due to conduction through the cell walls as well as the heat exchange due to radiation within the cell. Heat transfer by convection is neglible. An experimental investigation was conducted in which one surface of a honeycomb sandwich panel was heated by means of quartz radiant heaters and resulting transient temperatures of the panel skins were measured and recorded. The test specimens consisted of brazed steel, brazed titanium and bonded aluminum panels, each having a thickness of approximately 1/2 inch. Excellent agreement between the experimental measurements and the analytical predictions have been obtained. The results of the analytical and experimental investigations show that the heat transfer in the brazed panels is largely dependent on the thickness of brazing alloy which has accumulated on the cell walls during fabrication. (Author)

AD-436 333 Div. 17
OTS price $7.60

General Dynamics/Fort Worth, Tex.
CURRENT INFORMATION ON THE REFRACTORY METALS,
by C. E. King. 1 Dec 62, 78p. Rept. no. ERR FW049A
Contract AF33 657 11214
Unclassified report

Rev. to Rept. no. ERR FW049, AD-273 624.

Descriptors: (*Refractory metals, Data), (*Refractory metal alloys, Data), Abundance, Chromium, Molybdenum, Niobium, Tantalum, Tungsten, Vanadium, Molybdenum alloys, Niobium alloys, Titanium alloys, Tantalum alloys, Zirconium alloys, Tungsten alloys, Mechanical properties, Transition temperature, Recrystallization, Oxidation, Coatings, Machining, Material forming, Joining, Physical properties, Tables.

This revision to ERR-FW-049 (AD-273 624) was prompted by the need to keep the design information on the refractory metals as current as possible. Only a few alloys were added to those covered by the original report, but the elevated temperature data presented in the curves was completely revised to reflect the properties on production material obtained during 1961. In addition, two refractory alloys were purchased in sheet form and the tests on one of these alloys were completed in time to include in this report. This alloy is the 90 Tantalum- 10 Tungsten. The other alloy is the 10% Titanium-10% Molybdenum-80% Columbium alloy and will be tested during 1962. It is to be noted that vendor data on the 90 Tantalum-10 Tungsten alloy in the 2000 to 2200 F region is considerably higher than the data obtained on this alloy at General Dynamics/Fort Worth (GD/FW), indicating the wide scatter in properties obtainable on the same alloy chemistry. (Author)

AD-436 397 Div. 17, 26
OTS price $1.10

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS.
Rept. for 9 Dec 63-9 Mar 64,
by J. A. Houck. 27 Mar 64, 3p.
Unclassified report

Descriptors: (*Molybdenum, Reviews), (*Molybdenum alloys, Reviews, Ductility, Recrystallization, Strain (Mechanics), Extrusion, Forging, Transition temperature, Heat treatment, Tensile properties, Melting, Centrifugal casting, Material forming.

This is a brief review of new developments in the technology of molybdenum and its alloys, covering information that has become available to the Defense Information Center during the period from December 9, 1963, to March 9, 1964. (Author)

AD-436 569 Div. 17, 25
OTS price $1.10

Ohio State Univ., Columbus, Research Foundation.
THE MECHANISM OF OXIDE FORMATION IN THE INITIAL STAGES OF OXIDATION.
Final rept., 1 July 60-30 June 63,
by D. W. Rausch, K. L. Moazed and M. G. Fontana.
6 Mar 64, 6p. Rept. no. 13
Contract DA33 019ORD3387, OOR Proj. 2734C,
RF Proj. 1126
AROD 2734 2 Unclassified report

Descriptors: (*Refractory metals, Oxidation), (*Oxidation, Reaction kinetics), Low-pressure research, Electron diffraction analysis, Electron microscopy, Single crystals, Crystal lattice defects, Tungsten compounds, Tantalum compounds, Oxides, Adsorption, Nucleation, Surfaces, Contamination, Crystal growth, Temperature.

The purpose of this work was to investigate the reaction of gaseous oxygen with clean tungsten and tantalum substrates in the initial stages of oxidation in order to determine the role of chemical, physical, and structural factors--and hence the initial mechanism of oxidation. (Author)

AD-436 735 Div. 17
OTS price $2.60

General Dynamics/Fort Worth, Tex.
MATERIAL - STEEL SANDWICH PANELS - SILVER, COPPER.LITHIUM.BRAZED - CORROSION INHIBITOR FOR - DEVELOPMENT OF,
by E. W. Turns. 6 Mar 64, 21p. Rept. no. FGT3066
Contract AF33 600 41891
Unclassified report

Descriptors: (*Sandwich panels, Stainless steel), (*Corrosion inhibition, Materials), Brazing, Silver solders, Silver alloys, Copper alloys, Lithium alloys, Phosphoric acids, Potassium compounds, Chromates, Sodium compounds, Silicates, Effectiveness, Controlled environment, Salt spray tests, Environmental tests.

Ag-Cu-Li brazed 17-7 PH stainless steel test panels were exposed to 650 F air for one week and

then treated in triplicate with ten different test corrosion inhibitors. These panels and uninhibited controls were then exposed for six weeks at the specified humidity. At the conclusion of the test, potassium chromate, sodium-metasilicate and phosphoric acid showed promise as inhibitors. Phosphoric acid was especially effective and eliminated virtually all corrosion. Since phosphoric acid is an active mineral acid, additional tests were conducted to determine the effects of removing the excess acid. It was shown that rinsing or neutralization treatment of the phosphoric acid inhibited panels prior to drying at 650 F removes the inhibitive effect. (Author)

AD-436 780 Div. 17, 1
Ots price $1.60

Michigan Univ., Ann Arbor, Coll. of Engineering.
EFFECT OF LONG-TIME CREEP ON STRUCTURAL SHEET MATERIALS.
Progress rept. no. 6,
by T. M. Cullen and J. W. Freeman. Dec 63, 12p.
Rept. no. 04853 31P
Contract AF33 616 8334, Proj. 1 8 7381, Task 73812
Unclassified report

Descriptors: (*Structural parts, Creep), (*High-temperature research, Stainless steel), (*Airplane panels, Heat treatment), Chromium alloys, Molybdenum alloys, Nickel alloys, Cold working, Supersonic planes, Transport planes, Stresses, Tensile properties, Hardness, Fracture (Mechanics).

AD-436 781 Div. 17, 1
OTS price $6.60

Lockheed Aircraft Co., Burbank, Calif.
FATIGUE BEHAVIOR OF MATERIALS FOR THE SUPERSONIC TRANSPORT.
Quarterly technical progress rept. no. 2, 1 Aug-31 Oct 63,
by A. J. McCulloch. 31 Oct 63, 70p. Rept. no. LR17437
Contract AF33 657 11460
Unclassified report

Descriptors: (*Supersonic planes, Materials), (*Fatigue (Mechanics), Alloys), Stainless steel, Nickel alloys, Titanium alloys, Thermal stresses, Sheets, Transport planes, Test methods, Test equipment, Tensile properties.

The fatigue behavior of candidate sheet materials subjected to supersonic transport load-temperature environments is being evaluated. Constant load amplitude tests will be carried out on specimens without prior exposure and on specimens explosed to load at temperatures of 400 and 600 F for periods of 100, 1000, and 5000 hours. The effects of contaminants will be similarly evaluated using exposure at 650 F for 1000 hours. This report presents static strength of the three materials in the basic program and room temperature S-N data for one of these. The test program and the test apparatus are described and a report on difficulties encountered in the attachment of thermocouples to titanium specimens is presented. (Author)

AD-436 887 Div. 17, 25
OTS price $1.00

Naval Radiological Defense Lab., San Francisco, Calif.
TOTAL NORMAL AND TOTAL HEMISPHERICAL EMITTANCE OF POLISHED METALS. PART III.
Rept. for 27 Feb-19 Dec 62,
by G. L. Abbott. Dec 63, 37p.
Proj. 7360, Task 736001
WADD TR61 94, pt. 3 Unclassified report

Report on the Chemistry and Physics of Materials,

Descriptors: (*Refractory metals, Emissivity), (*Emissivity, Refractory metals), Thermal radiation, Niobium, Tantalum, Tungsten, High-temperature research, Temperature, Resistance (Electrical), Measurement, Surfaces, Instrumentation, Thermocouples, Molybdenum, Platinum.

The total hemispherical emittance, the total normal emittance, and the variation of electrical resistivity with temperature were measured on aged surfaces of tantalum, niobium, and tungsten in a vacuum over a temperature range from 1000 K to 3000 K (subject to the material). In addition, the normal spectral emittance at 0.65 micron was measured on tantalum and niobium. The total hemispherical emittance was obtained from the measured power dissipation within the uniform temperature region at the center of an electrically heated ribbon; its temperature being measured with a thermocouple or an optical pyrometer when the spectral emittance was known. The total normal emittance was determined by using a radiation thermopile. The ratio of total hemispherical to total normal emittance was also calculated directly from the angular distribution of radiation obtained by revolving the ribbon within the field of view of the thermopile. Some data are also included on molybdenum from a previous report. (Author)

AD-437 102 Div. 17
OTS price $3.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
A-356 TYPE ALUMINUM CASTING ALLOY. PART I. EFFECT OF MAGNESIUM CONCENTRATION,
by W. A. Bailey. 3 Dec 63, 34p. Rept. no. SM43094
Unclassified report

Descriptors: (*Aluminum alloys, Mechanical properties), (*Castings, Aluminum alloys), Beryllium alloys, Magnesium alloys, Heat treatment, Aging (Materials), Silicon alloys, Metallography, Spectrophotometers, Microstructure, Chemical analysis, Tensile properties.

This investigation was conducted to deterime the effect of variations on magnesium content on the mechanical properties and part strengths of 'high purity' 356-T6 type aluminum alloys. Results are reported that were obtained from a series of similar 'Tee'-shaped test castings, poured by two foundries in both sand and permanent mold, using metal of three different compositions. The ''Tee's'' of all compositions were solution heat treat similarly and were aged for various times at two temperatures. (Author)

AD-437 103 Div. 17, 26
OTS price $2.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
PRELIMINARY EXPLORATION OF THE ALUMINUM - SILICON - MAGNESIUM ALLOY SYSTEM. PART 1,
by W. A. Bailey. 31 Nov 63, 24p. Rept. no. SM43109
Unclassified report

Descriptors: (*Aluminum alloys, Castings), (*Castings, Aluminum alloys), Iron, Silicon alloys, Impurities, Magnesium alloys, Beryllium, Heat treatment, Tensile properties, Radiography, Metallography, Casting, Hardness, Cooling.

This report outlines the evolution of cast 356-T6 type aluminum alloys. The early work

suggested that a reduction of the iron contamination, or an increase in properly precipitated magnesium silicide should result in stronger more ductile alloys. A preliminary series of aluminum alloys with constant magnesium and varying silicon and iron contents were cast into MIT Chill Plates, heat treated and tensile tested. This exploratory test work partially confirmed the hypothesis that elongation might be improved with decrease in iron impurity. (Author)

AD-437 104 Div. 17
OTS price $6.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
EVALUATION OF 18Ni-9Co-5Mo (300 KSI) MARAGING STEEL SHEET. PART 1: MECHANICAL PROPERTIES,
by D. L. Corn. 27 Nov 63, 64p. Rept. no. SM43110
Unclassified report

Descriptors: (*Maraging steels, Mechanical properties), (*Sheets, Maraging steels), Heat treatment, Austenite, Ductility, Aging (Materials), Toughness, Fracture (Mechanics), Quenching (Cooling), Elasticity, Stresses, Strain (Mechanics), Deformation, Experimental data, Pressure vessels.

This report covers the first phase of the study of the 18Ni-9Co-5Mo (300 ksi) maraging steels. The mechanical properties, including fracture toughness, are presented to demonstrate its utility for high strength pressure vessels. Uniaxial yield and ultimate strengths are reported for aging heat treatments ranging from 750 F for 312 hours (13 days) to 1050 F for 18 hours. Mechanical properties are also presented for the annealed condition as well as the effect of annealing temperature on aged strengths. The annealing study verified that austenite is stabilized in the 1200 to 1250 F annealing range. Duplex aging cycles were also investigated and were shown to be capable of achieving higher strengths than could be obtained with a single aging heat treatment in the same amount of time. (Author)

AD-437 105 Div. 17
OTS price $6.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
EVALUATION OF 18Ni-9Co-5Mo (300 KSI) MARAGING STEEL SHEET; PART II: METALLOGRAPHIC PROPERTIES AND METALLURGICAL CONSIDERATIONS,
by D. L. Corn. 6 Feb 64, 62p. Rept. no. SM43111
Unclassified report

Descriptors: (*Maraging steel, Heat treatment), (*Sheets, Maraging steel), (*Heat treatment, Maraging steel), Nickel alloys, Cobalt alloys, Molybdenum alloys, Austenite, Martensite, Phase studies, Ferrites, Aging (Materials), Microstructure, Tensile properties, Mechanical properties, Photomicrography.

An investigation of 18Ni-9Co-4Mo maraging steel revealed the grain size of the as-received material to be less than ASTM 8. Annealing at 1800 F for 6 hours increased this size to approximately ASTM 4. Annealing in the range 1200 F to 1250 F verified that austenite is formed and retained in significant amounts upon cooling to room temperature. It is suggested the stabilized austenite is surrounded by a ferrite envelope. Mechanical properties of annealed material are discussed. Material containing stabilized austenite displays annealed tensile properties which are a function of annealing temperature and time at annealing temperature. All microstructures representing the effects of aging alone were very similar. However, areas containing reverted austenite were observed in a specimen that had been aged at 950 F. Annealing had an observable influence on aged microstructure. Photomicrographs of annealed-and-aged specimens are presented which permit the approximation of the prior annealing temperature. (Author)

AD-437 106 Div. 17
OTS price $2.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
A STUDY OF THE COMPARATIVE STRENGTH OF 354 TYPE ALUMINUM - SILICON - COPPER - MAGNESIUM CASTING ALLOY,
by W. A. Bailey. 29 Jan 64, 26p. Rept. no. SM44636
Unclassified report

Descriptors: (*Aluminum alloys, Mechanical properties), (*Castings, Aluminum alloys), Copper alloys, Magnesium alloys, Silicon alloys, Heat treatment, Quenching (Cooling), Aging (Materials), Tensile properties.

Previous work with 354-T61, an aluminum-silicon-copper-magnesium casting alloy, had demonstrated a mechanical property advantage over the 356 variant-T6 aluminum alloy currently used in Douglas production. This advantage was confirmed. Optimumly heat treated, 354-T6 aluminum alloy showed a five to ten percent advantage in iron chill-cast ultimate and yield strength and a 20 to 35 percent advantage in part strength. The part strength levels achieved were comparable to the identical Tee - shaped configuration machined from wrought 1.5 inch thick 7075-T6 aluminum alloy plate and considerably in excess of values obtained with 2014-T6. (Author)

AD-437 108 Div. 17, 26, 27
OTS price $7.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
WELDABILITY OF 18Ni-9Co-5Mo MARAGING STEEL SHEET,
by M. M. Mabry. 16 Mar 64, 73p. Rept. no. SM44648
Unclassified report

Descriptors: (*Maraging steel, Arc welding), (*Sheets, Maraging Steel), (*Arc welding, Maraging steel), Heat treatment, Aging (Materials), Cold working, Fracture (Mechanics), Arc welds, Electrodes, Tungsten, Wires, Foils, Microstructure, Mechanical properties, Tensile properties, Rocket cases, Titanium alloys, Nickel alloys, Cobalt alloys, Molybdenum alloys, Iron alloys.

Results of a weldability study on 18Ni-9Co-5Mo maraging steel sheet are presented. The alloy is easily welded in either the annealed or the heat treated condition. Sound TIG welds can be produced without benefit or preheat or postheat. Simple aging treatments resulted in ultimate strengths ranging from 240 KSI to 319 KSI. Increasing the Ti content in the weld metal improved the weld strength. The maraging steel is less susceptible to hot-cracking than 4340 steel. The room temperature net-fracture strength was evaluated by the shallow-crack criterion. The effect of Ti content on the net fracture strength of the weld deposit was studied. The critical crack depth of 0.015 inches is similar for all levels of Ti. The net fracture strength decreased more rapidly in the higher Ti welds, after the critical crack depth is exceeded, than in relatively low Ti welds. (Author)

AD-437 110 Div. 17
OTS price $4.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
A-356 TYPE ALUMINUM CAST ALLOY. PART II.

EFFECT OF BERYLLIUM CONCENTRATION,
by W. A. Bailey. 20 Jan 64, 45p. Rept. no. SM44658

Unclassified report

Descriptors: (*Aluminum alloys, Mechanical properties), (*Castings, Aluminum alloys), Beryllium alloys, Magnesium alloys, Silicon alloys, Iron alloys, Contamination, Brittleness, Tensile properties, Metallography, Microstructure, Heat treatment, Aging (Materials), Temperature, Time.

This investigation was conducted to determine the effect of variations of beryllium content on the mechanical properties and part strengths of ''high purity'' 356-T6 type aluminum alloys. Results are reported that were obtained from a series of similar Tee - shaped test castings, poured by two foundries in both sand and permanent mold, using metal of six different compositions. The Tee's of all chemistries were solution heat treated similarly and were aged for various times at two temperatures. (Author)

AD-437 114 Div. 17
OTS price $3.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
CRYOGENIC PROPERTIES OF SEVEN EXPERIMENTAL TITANIUM ALLOYS,
by S. M. Weiman. 17 Mar 64, 31p. Rept. no. SM44674

Unclassified report

Descriptors: (*Titanium alloys, Cryogenics), (*Sheets, Titanium alloys), Aluminum alloys, Iron alloys, Tin alloys, Vanadium alloys, Zirconium alloys, Tensile properties, Toughness, Fracture (Mechanics), Microstructure.

There is need for high strength and high toughness titanium base sheet alloy for potential liquid hydrogen tankage applications. This report provides room temperature, -196 C(-320 F) and -253 C(-423 F) smooth and edge notch tensile data for sheet specimens of seven experimental titanium alloys. Also provided are a few partial crack toughness data points for Ti-4Al alloy. The most promising alloys were Ti-5Al-2.5Sn with low iron content and Ti-4Al. (Author)

AD-437 174 Div. 17
OTS price $3.60

Astronuclear Lab., Westinghouse Electric Corp., Pittsburgh, Pa.
PILOT PRODUCTION AND EVALUATION OF TANTALUM ALLOY SHEET.
Quarterly rept. no. 7, 15 Nov 63 to 15 Feb 64, by R. L. Ammon and R. T. Begly. 15 Apr 64, 35p. Rept. no. WANL PR M008
Contract N600 19 59762

Unclassified report

Descriptors: (*Tantalum alloys, Mechanical properties), (*Material forming, Tantalum alloys), Carbon alloys, Hafnium alloys, Tungsten alloys, Welds, High-temperature research, Ductility, Tensile properties, Stresses, Rupture, Phase studies, Chemical analysis, X-ray diffraction analysis.

The evaluation of T-222 (Ta-9.6W-2.4Hf-0.01C) sheet was continued with emphasis on the properties of a second heat of the alloy. The tensile and stress-rupture properties as well as the weld bend ductility of the second heat were superior to those of the first heat of T-222 produced. The evaluation of other Ta-W-Hf alloys showed that increasing the solute concentration of T-222 from 12 to 14% resulted in a substantial increase in 2400 F tensile strength while producing only a slight improvement at 3000 F. Increasing the carbon content of T-222 from 0.01 to 0.04% resulted in no significant change in mechanical properties. The substitution of nitrogen for carbon in T-222 produced no significant difference in properties. In a phase identification study, Ta2C and a complex FCC phase were identified, and their presence in T-222 was correlated with mechanical and thermal treatments. (Author)

AD-437 250 Div. 17
OTS price $2.60

General Dynamics, Fort Worth, Tex.
PLANE STRAIN FRACTURE TOUGHNESS OF LARGE D6ac STEEL SPECIMENS,
by R. J. Urban. 15 Apr 64, 27p. Rept. no. FGT3064
Contract AF33 651 8260 1

Unclassified report

Descriptors: (*Steel, Fracture (Mechanics)), (*Toughness, Steel), Rods, Heat treatment, Metal plates, Deflection, Loading (Mechanics), Strain (Mechanics), Tensile properties, Fractography.

Eighteen 2 x 2 x 24-in bars of Ladish D6ac rolled steel were tested in a bend test fixture to obtain a plane strain fracture toughness index K sub Ic. One bar was used to develop a calibration curve neeeddddeed to calculate this parameter. The other seventeen were tested to failure in bending. Of these, eight received the recommended heat treatment referred to herin as Aus-Bay, with air cooling after tempering; four received a heat treatment with no Aus-Bay and four received a heat treatment incorporating the Aus-Bay and a furnace coll to 500 F after second temper. The first set (Aus-Bay) had the best fracture toughness; the third set was almost as fracture tough as the first set (except for the -65 F data), and the second set (Aus-Bay, Furnace Cool) had the least fracture toughness. (Author)

AD-437 255 Div. 17, 26
OTS price $5.60

Solar, San Diego, Calif.
EVALUATION OF RMSP TUNGSTEN SHEET.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 64. 20 Apr 64, 55p. Rept. no. ER1399 3
Contract NOw63 0786d, Proj. 3478 62

Unclassified report

Descriptors: (*Tungsten, Sheets), (*Sheets, Tungsten), Thickness, Tensile properties, Transition temperature, Recrystallization, Ductility, Brittleness, Material forming, High-temperature research, Chemical analysis, Microstructure, Hardness, Mechanical properties.

The evaluation of the as-received four gages of RMSP tungsten sheets using standard acceptance test techniques was continued. Resistance heated elevated tensile tests, 5T and 6T bend-transition determinations, recrystallization measurements, and chemical analysis for carbon niobium were performed. The recrystallization measurements indicated that the recrystallization temperatures for the 0.010-, 0.020-, 0.060-, and 0.100 in. sheet, are 2450, 2500, 2525, and 2550 F, respectively. Blanking, perforating, and deep drawing investigations were conducted on each of the four tungsten sheet thicknesses. The results of the blanking and perforating studies indicate that these forming methods could be accomplished by control of sheet temperature, colse tolerance tooling, and control of forming procedures. Preliminary deep drawing of 0.060-inch tungsten sheet with a drop hammer was not successful. The

deep drawing of 0.060-inch and 0.100-inch tungsten sheet was successfully accomplished with steel tooling and a hydraulic press. (Author)

AD-437 260 Div. 17
OTS price $5.60

Linde Co., Div. of Union Carbide Corp., Indianapolis, Ind.
FABRICATION AND DEFORMATION OF TUNGSTEN SINGLE CRYSTALS. PART I. EFFECT OF BILLET ROLLING PLANE AND ROLLING DIRECTION ON THE RECRYSTALLIZATION TEMPERATURE OF SHEET FROM TUNGSTEN SINGLE CRYSTALS. PART II. RECRYSTALLIZATION OF WORKED SINGLE CRYSTALS OF TUNGSTEN.
Final rept.,
by A. C. Walters, R. G. Rudness, M. Stern, N. G. Reuter and L. Raymond. 28 Aug 63, 60p.
Contract NOw61 0671c
Unclassified report

Subcontract to Aeronutronic, Newport Beach, Calif.

Descriptors: (*Tungsten, Single crystals), (*Rolling (Metallurgy), Sheets), Crystal structure, Deformation, Shear stresses, Hardening, Tensile properties, Crystal growth, Grain structures (Metallurgy), Crystal lattice defects.

The sheet rolled from the 011(100) oriented tungsten single crystal billet had an increasingly superior recrystallization temperature over the 100(001), 100(011), and 011(011) orientations at all reductions in thickness tested in the order given. This substantiates the premise on which the study was begun that the recrystallization temperature is dependent on the initial billet rolling plane-rolling direction orientations. This dependence seems related to the slip systems available for deformation and the values of shear stress from the compressive rolling stress resolved on these slip planes. A special easy deformation mode is shown as possibly existing in those rolling orientations having the highest recrystallization temperatures in which a slip direction and rolling direction are coplanar with a force direction acting on a favorably oriented slip plane to give a high resolved shear stress and cause deformation to occur in the direction of rolling. (Author)

AD-437 261 Div. 17, 1
OTS price $12.50

Lockheed Aircraft Corp., Burbank, Calif.
FATIGUE BEHAVIOR OF MATERIALS FOR THE SUPERSONIC TRANSPORT.
Quarterly technical progress rept. no. 3, 1 Nov 63-31 Jan 64,
10 by A. J. McCulloch. 31 Jan 64, 179p. Rept. no. LR 17642; LAC 419280
Contract AF33 657 11460
Unclassified report

Descriptors: (*Supersonic planes, Materials), (*Nickel alloys, Fatigue (Mechanics)), (*Stainless steel, Fatigue (Mechanics)), (*Titanium alloys, Fatigue (Mechanics)), Sheets, High-temperature research, Test methods, Wings, Fuselages, Loading (Mechanics), Contamination, Experimental data, Welds, Spot welds, Tables, Transport planes.

The fatigue behavior of sheet materials subjected to supersonic transport load-temperature environments is being evaluated. In addition to a detailed description of the test program, this report presents extensive data obtained in constant load amplitude tests without contaminants, preliminary data on the effects of contaminants, and preliminary data obtained in evaluations of fuselage and wing root loading histories. (Author)

AD-437 328 Div. 17
OTS price $2.00

Defense Metals Information Center, Columbus, Ohio.
THE APPLICATION OF HIGH PRESSURE IN METAL-DEFORMATION PROCESSING. REPORT ON AN INFORMAL SYMPOSIUM OF THE METALWORKING PROCESSES AND EQUIPMENT PROGRAM,
by F. W. Boulger and B. A. Wilcox. 2 Mar 64, 74p.
Rept. no. 199
Contract AF33 615 1121
Unclassified report

Descriptors: (*Symposia, Material forming), (*Metals, High pressure research), (*Material forming, Symposia), Deformation, Hydrostatic pressure, Ductility, Hydrodynamics, Extrusion, Forging, Mechanical properties, Mechanical working, Recrystallization, Recovery, Kinetic theory, Grain structures (Metallurgy), Stability, Bibliographies, Compressive properties, Phase studies, Hydroforming (Mechanical).

On October 3, 1963, a symposium was sponsored by the Bureau of Naval Weapons, Metalworking Processes and Equipment Program, on the application of high pressure in metal-deformation processing. Past research has shown that superimposed hydrostatic pressure can significantly increase the ductility at fracture of various materials. These observations have stimulated considerable interest in applying this hydrostatic-pressure effect to metal deformation processing, where it was anticipated that improved ductility and fabricability of brittle materials could be realized. Hydrostatic extrusion and hydrodynamic compressive forging were two such fabrication techniques discussed at the symposium, and preliminary results were found to be encouraging. Another fabrication process that will be investigated in the near future is sheet drawing, where the effect of superimposed pressure improves the ductility to fracture, it was noted that pressure cycling did not improve either the strength or ductility of steels containing various amounts of carbon. In addition to the mechanical-property effects, hydrostatic pressure has been found to affect measurably, numerous metallurgical properties of metals and alloys. (Author)

AD-437 346 Div. 17, 30
OTS price $9.10

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PROJECT NEOS. A GENERAL STUDY OF PROCESSES FOR THE REALIZATION OF DESIGN CONFIGURATIONS IN MATERIALS.
Interim technical rept. no. 6, 3 Oct 63-3 Apr 64,
by Paul Rosenthal. Apr 64, 103p. Rept. no. NM1559P6
Contract AF33 600 42921, ASD Proj. 7 867
ASD IR6 Unclassified report

Descriptors: (*Machining, Material removal), Design, Brittleness, Oxidation, Material removal, Liquid metals, Model tests, Lasers, Hot working, Machining, Electromagnetic fields, Density, Energy, Power, Gallium, Mercury, Carbon tetrachloride, Diffusion, Anisotropy, Thermal radiation, Crystallography, Electron bombardment, Molybdenum, Zirconium.

Three categories of energy-material interactions are discussed; Embrittlement, oxidation and high power density effects. (1) The reversibility of embrittlement by a liquid metal is demonstrated in a model experiment and is applied to an embrittlement machining experiment; (2) local oxidation at room temperature is demonstrated and applied in a combustion machining experiment; (3) high power density effects are investigated by means of laser beams and the mechanism of material removal is described. (Author)

Division 17 - METALLURGY

AD-437 376 Div. 17, 26
OTS price $1.10

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS OXIDATION-RESISTANT COATINGS FOR REFRACTORY METALS,
by J. J. English. 24 Apr 64, 3p.
Unclassified report

Descriptors: (*Refractory metal alloys, Protective treatments), (*Coatings, Oxidation), (*Corrosion-resistant alloys, Coatings), Silicides, Niobium alloys, Molybdenum alloys, Tantalum alloys, Mechanical properties, Creep, Ductility, Foils, Reviews.

AD-437 500 Div. 17
OTS price $9.60

Colorado School of Mines, Golden.
IMPROVED OXIDATION RESISTANCE OF MOLYBDENUM BY ALLOYING WITH HAFNIUM.
Final rept. 1 Nov 61-31 Aug 63.
3 Sep 63, 117p.
Contract NOw62 0305d, Proj. 311113,
Unclassified report

Descriptors: (*Molybdenum alloys, Corrosion-resistant alloys), (*Hafnium alloys, Corrosion-resistant alloys), (*Corrosion-resistant alloys, Oxidation), Reaction kinetics, Diffusion, Oxygen, Hafnium, Temperature, Pressure, Oxides, Scale.

Preferential oxidation of a thermodynamically active metal component in a binary molybdenum base alloy has been used successfully to study the kinetics and mechanism of oxidation of that alloy and to determine the diffusion coefficient of the active component in the alloy. The system chosen was molybdenumhafnium. Diffusion coefficients for hafnium in molybdenum were independently predicted and checked the ones which were obtained by the selective oxidation method quite well. (Author)

AD-437 579 Div. 17
OTS price $3.60

Manufacturing Labs., Inc., Cambridge, Mass.
TRANSFORMATIONS IN IRON RUTHENIUM ALLOYS UNDER HIGH PRESSURE,
by L. D. Blackburn, Larry Kaufman and Morris Cohen. Apr 64, 39p. Rept. no. TR8
Contract Nonr260000
Unclassified report

Descriptors: (*Iron alloys, Phase studies), (*Ruthenium alloys, Phase studies), Transformations, High-pressure research, Transition temperatures, Temperature, Resistance (Electrical), Pressure, X-ray diffraction analysis, Crystal structure.

At atmospheric pressure, iron-ruthenium alloys containing less than 12 at.-% ruthenium exhibit a diffusionless alpha (b.c.c.)=gamma (f.c.c.) transformation on heating and cooling, while alloys containing 12-36 at.-% ruthenium exhibit a diffusionless epsilon (h.c.p.)=gamma (f.c.c.) transformation. High pressure displaces the alpha=gamma reaction to lower temperatures, but shifts the epsilon=gamma reaction to higher temperatures. These effects appear to be governed by the pressure dependence of the thermodynamic properties. The application of pressure also produces a new transformation, alpha = epsilon, at room temperature in alloys which contain the alpha-phase at atmospheric pressure. Pressure-temperature diagrams at constant composition thus contain triple points involving b.c.c. alpha, f.c.c. gamma and h.c.p. epsilon. As the ruthenium content is increased, the triple-point pressure decreases continuously. (Author)

AD-437 583 Div. 17, 25
OTS price $1.10

Metals Processing Lab., Mass. Inst. of Tech., Cambridge.
DEFORMATION PROCESSING OF ANISOTROPIC METALS.
Progress rept. no. 4, 1 Jan-29 Feb 64,
by D. H. Avery and W. A. Backofen. Apr 64, 5p.
Contract NOw63 0564d
Unclassified report

Descriptors: (*Titanium alloys, Deformation), (*Metals, Anisotropy), Aluminum alloys, Oxygen, Hardening, Plasticity, Tensile properties, Compressive properties, Stresses, Strain (Mechanics), Theory, Crystal structure.

An experimental determination of the yield locus for a 3/16-in.-thick sheet of a 4 Al-1/14 02 alpha-titanium alloy was made. The amount of texture hardening in this alloy is large. Yield-locus diagrams are presented for 0.2% strain. The innter curve is predicted according to the Mises yield condition for an isotropic material. The uter curve was calculated from anisotropic plasticity theory using the yield strengths and plastic strain ratios from unidirectional tensile tests in rolling and transverse directions. Experimental points for combined-stress loading were obtained from through-thickness compression and plane-strain tests (both tension and compression). (Author)

AD-437 591 Div. 17, 26, 1
OTS price $1.60

General Dynamics, Fort Worth, Tex.
AN INVESTIGATION OF 18 NiCoMo (300) MAR-AGING STEEL FORGINGS.
15 Apr 64, 12p. Rept. no. FZM2608
Unclassified report

Descriptors: (*Maraging steel, Forging), (*Material forming, Forging), (*Forging, Material forming), Temperature, Aging (Materials), Heat treatment, Fracture (Mechanics), Fatigue (Mechanics), Stresses, Corrosion, Tests, Tables, Experimental data, Landing gear.

AD-437 626 Div. 17
OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NEWS OF THE ACADEMY OF SCIENCE USSR. DIVISION OF TECHNICAL SCIENCES (SELECTED ARTICLES).
6 Dec 63, 21p.
FTD MT63 199 Unclassified report

Trans. from Izvestiya AN SSSR, Otedeleniye Tekhnicheskikh Nauk, No. 3, pp. 113-118 and 118-119, 1958.

Descriptors: (*Powder alloys, Fatique (Mechanics)), (*Aluminum alloys, Nickel alloys), (*Nickel alloys, Aluminum alloys), USSR, Tungsten alloys, Carbon alloys, Cobalt alloys, Hardness, Electrical properties.

AD-437 658 Div. 17, 25
OTS price $4.60

Illinois Univ., Urbana.
QUENCHING AND ANNEALING OF ZONE REFINED ALUMINUM,
by M. Doyama and J. S. Koehler. Sep 63, 46p.
Rept. no. TR1
Contract DA31 124ARO D65
AROD 3369 1 Unclassified report

Descriptors: (*Aluminum, Heat treatment), Purification, Zone melting, Quenching, Heat of activation, Dynamics, Crystal lattice defects.

During the last several years an appreciable amount of information concerning point defects has been obtained both from equilibrium and non-equilibrium measurements. When metals are quenched from a high temperature to a low temperature most of the imperfections present in thermal equilibrium at the high temperature can be frozen in. In close-packed metals the dominant imperfections are vacancies, vacancy clusters, and dislocations arising from collapsed vacancy clusters. This research is aimed at determining the activation energy for motion of a divacancy and the binding energy of a divacancy as well as investigating the binding energy of larger clusters in aluminum. The activation energy for motion of a divacancy in aluminum was interpreted to be 0.50 ± 0.04 eV. The binding energy of a divacancy in aluminum was interpreted to be 0.17 ± 0.05 eV. (Author)

AD-437 660 Div. 17, 14
OTS price $11.00

Martin-Marietta Corp., Denver, Colo.
CRYOGENIC MATERIALS DATA HANDBOOK.
Progress rept. no. 12,
15 Oct 62, 146p.
Contract AF33 657 9161, Proj. 7381, Task 738103
Unclassified report

Available from OTS as PB 171809 4.

Descriptors: (*Handbooks, Cryogenics), (*Cyogenics, Materials), Low-temperature alloys, Aluminum alloys, Cobalt alloys, Iron alloys, Steel, Stainless steel, Nickel alloys, Titanium alloys, Titanium compounds, Tungsten compounds, Carbides, Ice, Halocarbon plastics, Polyester plastics, Nylon, Molybdenum, Beryllium, Mechanical properties, Electrical properties, Magnetic properties, Compressive properties, Thermal conductivity, Stresses.

AD-437 809 Div. 17
OTS price $3.60

Army Missile Command, Redstone Arsenal, Ala.
THE EFFECT OF SHEET THICKNESS ON THE TOUGHNESS OF 18-9-5 MARAGING STEEL,
by William S. Crownover and James W. Wright, Jr.
20 Mar 64, 33p.
Proj. 1B222901A205
AMC RA RK TR64 8 Unclassified report

Descriptors: (*Maraging steel, Toughness), (*Sheets, Thickness), Heat treatment, Tensile properties, Temperature, Hardness, Nickel alloys, Cobalt alloys, Molybdenum alloys.

A study was made to determine the effect of sheet thickness on the toughness of an 18-9-5 maraging steel. To date, a large amount of data has been generated on the toughness of this type material, particularly in thicker sections, but very little has been accumulated for a range of sheet thicknesses. The material was examined in thicknesses ranging from 0.020 to 0.120 in.. To study the toughness of this material, the notched-to-smooth tensile test was used. Notch properties were obtained at room temperature and at 60 F. For this heat of steel, there is a noticeable degrading effect on the toughness at thicknesses of 0.080 in. or greater for three different maraging conditions. Low temperatures have only a slight degrading effect on the toughness of this material over the range of thicknesses examined. (Author)

AD-437 881 Div. 17
OTS price $2.60

General Dynamics, Fort Worth, Tex.
MATERIAL EVALUATION OF H-11 HIGH STRENGTH STEEL FOR F-111.
15 Apr 64, 28p. Rept. no. FTDM 3177
Unclassified report

Descriptors: (*Steel, Mechanical properties), Metal plates, Arc welds, Tensile properties, Fatigue (Mechanics), Test equipment, Tables, Experimental data, Heat treatment, Forging.

Empirical data are presented in this report and no conclusions are made. (Author)

AD-437 882 Div. 17
OTS price $1.10

Bureau of Mines, Albany, Oreg.
BUREAU OF NAVAL WEAPONS REFRACTORY METAL STANDARDS PROGRAM.
Quarterly progress rept. no. 2 for Dec 63.
by A. H. Roberson. Dec 63, 3p.
Unclassified report

Descriptors: (*Refractory metal alloys, Metallurgical analysis), (*Molybdenum alloys, Metallurgical analysis), (*Niobium alloys, Metallurgical analysis), (*Tantalum alloys, Metallurgical analysis), (*Tungsten, Metallurgical analysis), Refractory metals, Impurities, Rods, Preparation.

The object of this program is to prepare and screen by analysis four reference samples of refractory metal alloys. The four alloys selected are TZM (Mo-0.5Ti - 0.8 Zr), FS-85 (Cb - 27Ta - 0.7 Zr - 10 W), T-111 Ta - 8W - 2 Hf), and Pure Tungsten. Screening analyses for hydrogen, nitrogen and oxygen were completed for TZM, FS-85 and T-111 and are in the final stages for the unalloyed tungsten. The machine chips from TZM, FS-85, and T-111 will soon be thoroughly mixed and sampled for analysis of alloy elements and carbon. (Author)

AD-437 885 Div. 17
OTS price $1.10

General Dynamics/Forth Worth, Tex.
MATERIAL EVALUATION - CHARPY IMPACT STRENGTH D6AC AND 4330-V STEEL ALLOY.
15 Apr 64, 4p. Rept. no. FTDM3135
Unclassified report

Descriptors: (*Stainless steel, Toughness), Jet fighters, Impact shock, Low-temperature research, Tests, Processing, Heat treatment.

The Charpy impact strength of D6ac and 4330-V alloy steel at R.T. and -65 F was determined. Both the well forged 4330-V (longitudinal direction) and D6ac billet material (long-transverse direction) exceeded an average of 15 foot-pounds Charpy 'V' notch impact strength at R.T. and -65 F. (Author)

AD-437 887 Div. 17
OTS price $1.60

General Dynamics/Fort Worth, Tex.
PLANE STRAIN FRACTURE TOUGHNESS OF LARGE D6ac STEEL SPECIMENS HEAT TREATED TO 220-240 AND 260-280 KSI STRENGTH LEVEL.
15 Apr 64, 11p. Rept. no. FTDM3178
Unclassified report

Descriptors: (*Steel, Fracture (Mechanics)), (*Metal plates, Steel), Toughness, Stresses, Tensile properties, Tables, Heat treatment.

The plane strain fracture toughness indexes calculated for the 260-280 ksi heat treat are included as empirical data. The modified normalize heat treatment was not detrimental to the plane strain fracture toughness indexes of D6ac steels heat treated to the 220-240 ksi range. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-435 767 Div. 18
OTS price $3.60

RAND Corp., Santa Monica, Calif.
SOME THOUGHTS ON STRUCTURING AN OPERATIONAL DEFENSE COMMAND,
by Samuel M. Genensky. Mar 64, 33p. Rept. no. P 2876
Unclassified report

Descriptors: (*Command & control systems, Theory), (*Operational research, National defense), Military communications, Defense systems.

A set of logical and self-consistent functions is developed for a hypothetical command charged with tha air, land, sea, and space defense of North America. These functions are evolved by exploring the functions that might be performed by a pair of hypothetical commands of superior rank in the same hierarchy. The technique illustrated is applicable to the development of a set of logical and self-consistent functions for any joint or single service command. (Author)

AD-435 768 Div. 18
OTS price $1.60

RAND Corp., Santa Monica, Calif.
NUCLEAR FORCES AND THE FUTURE OF NATO,
by E. Vandevanter, Jr. Jan 64, 15p. Rept. no. P 2739 1
Unclassified report

Descriptors: (*Political science, Nuclear weapons), (*Military organizations, Effectiveness), Tactical weapons, Germany, France, Control, Military strategy, Foreign policy, Nuclear warfare.

AD-436 353 Div. 18, 32
OTS price $21.00

American U., Washington, D. C.
UNDERGROUNDS IN INSURGENT, REVOLUTIONARY, AND RESISTANCE WARFARE,
by Andrew R. Molnar, William A. Lybrand, Lorna Hahn, James L. Kirkman and Peter B. Riddleberger. Nov 63, 369p.
Unclassified report

Descriptors: (*Counterinsurgency, History), (*Limited warfare, History), Military tactics, Guerilla warfare, Countermeasures, Tactical warfare, Communists, Communication systems, France, Sabotage, Malaya, Algeria, Philippines, Japan, Yugoslavia, Greece, Israel, Communism, Military strategy, Psychological warfare, Military organizations, Military personnel, Military intelligence, Urban areas, Rural areas, Costs, Government (Foreign), Logistics, Prisoners, Propaganda, USSR, Germany, China, Evasion.

Contents: Undergrounds: strategy, tactics, and countermeasures. The role of undergrounds in resistance and revolutionary ware. (2) Underground administrative functions and techniques; (3) underground operational functions and techniques; (4) communist use of undergrounds in resistance and revolution; (5) government countermeasures; cases of undergrounds in resistance and revolution: (6) France (1940-45); (7) Yugoslavia (1941-45); (8) Malaya (1948-60); (9) Algeria (1954-62); (10) Greece (1945-49); (11) The Philippines (1946-54); (12) Palestine (1945-48). (Author)

AD-436 529 Div. 18, 15
OTS price $2.60

System Development Corp., Santa Monica, Calif.
STOCHASTIC DUELS OF LIMITED TIME-DURATION,
by C. J. Ancker, Jr. 30 Mar 64, 25p. Rept. no. SP1017 005 00
Unclassified report

Descriptors: (*Sampling (Mathematics), Stochastic processes), (*Stochastic processes, Statistical analysis), Kill probabilities, Time, Theory.

This paper continues the development of the theory of stochastic duels to include the case where there is a time limitation on the duration of the duel. An example of this situation is fighter-bomber combat in which the fighter has a very limited fuel supply. In this duel, two contestants (with unlimited ammunition supplies) fire at each other with constant kill probabilities. The time between rounds fired is either (1) a continuous random variable or (2) constant. The duel proceeds until one or both of the contestants are killed or until the time limit is exceeded. The time limit is either (1) a continuous random variable or (2) constant. General solutions are derived for these various situations and specific examples given. (Author)

AD-436 817 Div. 18, 32
OTS price $4.60

American U., Washington, D. C.
UNCONVENTIONAL WARFARE BIBLIOGRAPHY SUPPLEMENT NO. 2,
by Nancy Ann Gardner. Apr 64, 46p. Rept. no. RM64 6
Unclassified report

Descriptors: (*Bibliographies, Unconventional warfare), (*Unconventional warfare, Bibliographies), (*Unconventional warfare, Models (Simulations)), History, Theory, Military strategy, Recruiting, Logistics, Military organizations, Psychological warfare, Asia, Africa, East Europe, Latin America, Middle East, Iran, Iraq, Turkey, China, India, United States, USSR, West Europe, Philippines, Population.

AD-437 247 Div. 18, 16, 20, 28
OTS price $2.75

Office of Naval Research, Washington, D. C.
THE SIXTH NAVY SCIENCE SYMPOSIUM, WEAPONS AND WEAPONS EFFECTS.
May 62, 133p.
ONR 12, vol. 1 Unclassified report

Descriptors: (*Symposia, Weapon systems), (*Weapon systems, Symposia), Naval research, Atmosphere, Radioactivity, Natural radioactivity, Artificial radioactivity, Radioactive fallout, Radiation monitors, Military psychology, Public opinion, Chemical warfare agents, Decontamination, Water, Wind, Ships, X rays, Nuclear explosions, Detection, Ionosphere, Very low frequency, Detection, Electron density, Space environmental conditions, Radiobiology, Radiological dosage, Radiation injuries, Recovery, Thermal radiation, Burns, Space weapons, Blast.

Papers are included on Atmospheric Radioactivity; Behavior of Buried Arches Under Blast Loading; Psychological Aspects of Weapons and Weaponry; Chemical Warfare Decontamination by Wind and Water; VLF Detection of Nuclear Detonations in Space; Biological Meaning of Space Radiations; Recovery from Acute Radiation Injury; and Thermal Radiation Phenomenology for Millisecond Pulses.

AD-437 492 Div. 18
OTS price $3.60

Rand Corp., Santa Monica, Calif.
ON DECISIONMAKING IN LARGE ORGANIZATIONS,
by William M. Jones. Mar 64, 32p. Memo. no. RM3968 PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Military organizations, Decision making), (*Decision making, Military organizations), Military communications, Command & control systems, Processing, Analysis.

AD-437 699 Div. 18, 32
OTS price $5.60

RAND Corp., Santa Monica, Calif.
AN APPRECIATION OF THE VALUE OF CONTINENTAL DEFENSE,
by Roger Levien. Mar 64, 50p. Memo. no. RM3987PR
Contract AF49 638 700
Unclassified report

Descriptors: (*National defense, Economics), (*Geography, National defense), Political science, Military organizations.

AD-437 749 Div. 18, 28
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COMMANDER AND TIME, AND WHAT IS YOUR OPINION, COMRADE READERS,
by L. Goncharov. 27 Feb 64, 9p.
FTD TT64 110 Unclassified report

Trans. from Krasnaya Zvezda, 18 Jan 1964.

Descriptors: (*Military training, Military requirements), Military psychology, Military organizations, Armament, Military tactics, Nuclear weapons, USSR.

AD-437 764 Div. 18
OTS price $2.60

RAND Corp., Santa Monica, Calif.
SYSTEMS ANALYSIS AND SUPPLY MANAGEMENT,
by G. J. Feeney and C. C. Sherbrooke. Apr 64, 23p. Rept. no. RM4054PR
Contract AF49 638 700
Unclassified report

Descriptors (*Supply depots, Stock level control), (*Stock level control, Management planning), (*Management planning, Supply depots), Costs, Probability, Spare parts, Inventory control, Air Force equipment, Reliability.

This study maintains that supply management problems should be approached from the viewpoint of system analysis. That is; individual item decisions should be based on analysis of system behavior. Two broad areas research are discussed; stock policy and demand analysis. (Author)

19. NAVIGATION

AD-435 463 Div. 19
OTS price $19.75

Minneapolis-Honeywell Regulator Co., St. Petersburg, Fla.
ELECTROSTATIC GYRO EVALUATION PROGRAM GYRO TEST SPECIFICATIONS. VOLUME II: APPENDIX B. PROGRAM SPECIFICATION FOR THE STRAPPED-DOWN AESG DATA ANALYSIS SYSTEM.
Final rept.,
by Robert Ritter. 15 Feb 64, 308p. Rept. no. AR61811TR5
Contract AF33 616 8350, Proj. 5201, Task 520110
AL TDR64 34, vol. 2 Unclassified report

Descriptors: (*Gyroscopes, Electrostatics), (*Digital computers, Gyroscopes), Data processing systems, Punched tape, Magnetic tape, Programming (Computers), Data transmission systems, Input-output devices, Equations, Digital systems, Motion.

This volume contains the specifications and program listings for a digital computer program to analyze the Strapped-Down Airborne Electrostatic Gyro. This data analysis problem involves comparing gyro motion equations with the actual gyro data to determine the performance of the gyro. Contained in this appendix is a description of each of the various programs and a listing of each. (Author)

AD-435 464 Div. 19
OTS price $18.00

Minneapolis-Honeywell Regulator Co., St. Petersburg, Fla.
ELECTROSTATIC GYRO EVALUATION PROGRAM GYRO TEST SPECIFICATIONS. VOLUME III: APPENDIX C, PROGRAM SPECIFICATION FOR THE GIMBALED AESG DATA ANALYSIS SYSTEM.
Final rept.,
by Robert Ritter. 15 Feb 64, 282p. Rept. no. 61811TR5
Contract AF33 616 8350, Proj. 5201, Task 520110
AL TDR64 34, vol. 3 Unclassified report

Descriptors: (*Gyroscopes, Programming (Computers)), Digital computers, Specifications, Gimbals, Airborne, Performance (Engineering), Input-output devices, Simulation, Data prcessing systems, Inertial guidance, Inertial navigation.

Appendix C, Volume III contains the specifications and program listings for a digital computer program to analyze the Gimbaled Airborne Electrostatic Gyro. This data analysis problem involves comparing gyro motion equations with the actual gyro data to determine the performance of the gyro. Contained in this Appendix is a description of each of the various programs and a listing of each. (Author)

AD-435 570 Div. 19
OTS price $16.50

Institute of Science and Tech., Univ. of Michigan, Ann Arbor.
STUDY AND ANALYSIS OF POSITION DATA ACQUISITION TECHNIQUES FOR OVER-OCEAN AIR TRAFFIC CONTROL.
Final rept. Apr 62-Apr 63,
by Lyle D. Filkins, Joseph W. Little, James O'Day and Robert E. Scott. Dec 63, 257p.
Rept. nos. 5088 12F, RD64 6
Contract FAA ARDS506, Proj. 116 9R
Unclassified report

Descriptors: (*Air traffic control systems, Oceans), (*Position finding, Oceans), Range

finding, Navigation satellites, Equatorial orbit trajectories, Synchronous satellites, Civil aviation, Atlantic ocean, Radio navigation, Radar navigation, High frequency, Ionospheric propagation, Flight paths.

Techniques were studied for supplying positional data on aircraft traversing oceanic areas to an air traffic control system. The purpose was to determine which techniques might be technically feasible during the time period from the present to 1975. It was concluded that: (1) Hybrid navigation systems presently available will determine the position of an airplane with acceptable accuracy, but a considerable improvement in long-range air-to-ground communications (probably achievable only by a synchronous satellite system) must occur before an advanced reported air-observed position determination system can be implemented. (2) A network of shipborne Rho-Theta observation units is technically capable of immediate implementation for the North Atlantic minimum time path envelope between New York and London (or any similar route), but a number of operational and other non-technical problems must be solved before this approach could be recommended. (3) High-frequency techniques are unacceptable for this application. (Author)

AD-436 110 Div. 19
OTS price $12.00

General Electric Co., Johnson City, N. Y.
A STUDY OF THE USE OF REDUNDANT INFORMATION ON SPACE GUIDANCE SYSTEMS TO ACHIEVE MALFUNCTION DETECTION AND CONTROL.
Final rept., 15 June 63-15 Jan 64,
by H. B. Haake, R. O. McCary, R. Rapacz, G. T. Sendzuk and G. K. Smith. Apr 64, 166p.
Contract AF33 657 11654, Proj. 3181, Task 318108
AL TDR64 60 Unclassified report

Report on Guidance for Space Systems.

Descriptors: (*Space navigation, Reliability), Digital computers, Redundant components, Malfunctions, Detection, Orbital trajectories, Optical scanning, Monitors, Errors, Analysis, Radio altimeters, Radar navigation, Data storage systems, Horizon scanners, Reconnaissance satellites, Satellite attitude, Attitude control systems, Atomic clocks, Failure (Mechanics), Computer logic.

A theoretical orbital navigation system was synthesized that employs techniques for achieving a high degree of reliability through the application of redundant equipment, and malfunction detection capability. Malfunction detection is used to implement standby redundancy, or to reorganize the system to permit continued operation, with fewer sensors, subsequent to measurement subsystem failures. The latter case results in progressive performance degradation. The resulting potential modes of operation are defined, and the level of performance, in terms of orbit determination accuracy, has been evaluated for each. The mission assumed was to provide for attitude control and guidance for relatively infrequent orbital maneuvers for an unmanned satellite surveillance unmanned mission has precluded the use of manual repair techniques. The reliability goal has been to achieve a system capable of a 40,000 hour equivalent mean time to failure for a 10,000 hour mission, with a growth capability to 270,000 hours equivalent mean-time-to failure. (Author)

AD-436 452 Div. 19
OTS price $12.00

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
TEST METHODS AND PERFORMANCE PARAMETERS FOR INERTIAL NAVIGATION EQUIPMENT.
Final rept.,
by J. M. Buchanan. June 63, 167p. Rept. no. R413
Contract AF29 600 2068
Unclassified report

Descriptors: (*Inertial navigation, Test methods), Performance (Engineering), Accelerometers, Errors, Standards, Gyroscopes.

AD-436 851 Div. 19, 6
OTS price $19.75

Radio Corp. of America, Burlington, Mass.
DESIGN OF AUXILIARY AIRFIELD CONTROL CENTRAL.
Final rept., 6 May-31 Dec 63,
by J. J. Lauginiger, E. LeBlanc and D. Weise.
Dec 63, 308p.
Contract AF19 628 2964
ESD TDR64 185 Unclassified report

Descriptors: (*Ground-controlled approach radar, Mobile), Air traffic control systems, Command & control systems, Navigational aids, Design, Approach indicators, Radar beacons, Communication systems, Search radar, Identification systems, Very high frequency, Ultra-high frequency.

This report specifies in both quantitative and qualitative terms the technical parameters, characteristics, and performance of a new light-weight, air transportable radar control central design capable of exerting final approach control at auxiliary airfields, which includes in detail, the basic requirements and operational parameters of an airport surveillance radar set, a radar beacon interrogator set, a precision approach radar set, radar display indicators, radio and telephone communications configuration, air conditioning and power requirements, and weather reporting facilities, along with their respective space and housing requirements. Included in the appendices are sample calculations, tables and graphs relative to radar range, performance, and specifications. (Author)

AD-437 503 Div. 19
OTS price $5.60

Army Electronic Proving Ground, Fort Huachuca, Ariz.
THE TRANSMITTING SYSTEM POSITION FIXING AND NAVIGATION AN/GRN-14 (PFNS). PRINCIPLE AND EMPLOYMENT,
by Robert E. Denney. 1964, 53p.
Unclassified report

Descriptors: (*Position finding, Radio navigation), Radio transmitters, Low frequency, Monitors, Correlators, Radio receivers, Errors, Mapping, Navigation charts, Distortion, Programming (Computers).

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-435 163 Div. 20
OTS price $10.50

Radiation Effects Information Center, Columbus Ohio.
REPORT ON RADIATION-EFFECTS STATE OF THE ART 1962-1963 TO AIR FORCE SYSTEMS COMMAND AERONAUTICAL SYSTEMS DIVISION.
30 June 63, 134p. Rept. no. 28
Contract AF33 657 10085, Proj. 7381 and 7634, Task 738103
Unclassified report

Descriptors: (*Radiation damage, Reviews), Semiconductor devices, Electronic equipment, Polymers, Fuels, Lubricants, Ceramic materials, Fast neutrons.

AD-435 519 Div. 20
OTS price $4.60

Ballistic Research Lab., Aberdeen Proving Ground, Md.
DEPENDENCE OF NEUTRON ALBEDOS UPON HYDROGEN CONTENT OF A SHIELD,
by Frank J. Allen, Arnold Futterer and William Wright. Oct 63, 50p.
Proj. 1A022601A088
BRL 1224 Unclassified report

Descriptors: (*Albedo, Neutron flux), Radiation effects, Shielding, Hydrogen, Neutrons, Dosage, Neutron scattering, Materials, Concrete, Soils, Water, Curve fitting.

Curves are presented which enable one to determine the neutron number current, number flux, energy, and dose albedos as functions of the hydrogen content of a shield material. The curves are given for eight incident energies: 0.1, 0.25, 0.50, 1.0, 2.0, 3.0, 5.0, and 14.0 Mev and four incident angles: 0, 30, 45, and 70 degrees for each energy. A method is presented by means of which one can calculate changes in neutron albedos caused by changes in cutoff (or effective cutoff) energy. (Author)

AD-435 577 Div. 20
OTS price $1.60

Stanford Univ., Calif.
CROSS SECTION FOR HYPERON PRODUCTION BY NEUTRINOS,
by Frank Chilton. Aug 63, 14p. Rept. no. ITP95
Grant AF AFOSR62 452
Unclassified report

Descriptors: (*Hyperons, Differential cross section), Neutrinos, Nuclear spins, Leptons.

The cross section, differential in q square, is calcuttted for hyperon production by neutrinos (or any other spin 1/2 to spin 1/2 reaction). All six form factors are included. A closed form for the total cross section is given in the form of an expansion about asymptotic value assuming a q square dependence of the form factors. (Author)

AD-435 603 Div. 20
OTS price $10.50

Litton Systems, Inc., Woodland Hills, Calif.
EFFECTS OF NEUTRON AND GAMMA RAY SPECTRA ON FLIGHT CONTROL SYSTEMS.
Rept. for Jan 63-Mar 64,
by Alvin B. Kaufman, Harry R. Newhoff and Richard A. Gaz. Feb 64, 137p.
Contract AF33 657 10584
FDL TDR64 30 Unclassified report

Descriptors: (*Neutron spectrum, Flight control systems), (*Flight control systems, Neutron spectrum), (*Gamma ray spectra, Flight control systems), Dose rate, Theory, Radiation damage, Transistor amplifiers, Radiation hazards, Nuclear reactors.

This report deals with the program on Effects of Neutron and Gamma Ray Spectra on Flight Control Systems. The program encompassed theoretical and experimental tasks in which neutron and gamma ray spectra, dose rate, and neutron-gamma ratios were studied to determine their relative importance in predicting radiation damage to flight control systems in nuclear environments of advanced aerospace vehicles. Six different nuclear facilities were utilized for the radiation tests. Three of the reactors were steady state and three were pulse type. Each reactor produced a distinct spectrum and dose rate signature which was as fully defined as the state of the art permits. The empirical phase of the program was performed with 18 transistor gyro preamplifiers. These were divided into sets of three and each set was tested at 55 C in one of the six nuclear reactors. In addition, and concurrently, eight field effect transistors were exposed in each environmental test, inasmuch as insignificant permanent damage to the amplifiers was expected in the pulse irradiations and this otherwise would limit the extent of spectra-damage comparison. (Author)

AD-435 737 Div. 20, 15
OTS price $2.25

Northrop Space Lab., Hawthorne, Calif.
COMPUTER ANALYSIS OF RADIATION SHIELDING,
by R. E. Fortney. Feb 64, 89p. Rept. no. 63 168
Contract AF33 657 8762, Proj. 6301, Task 630101
AMRL TDR64 11 Unclassified report

Report on Aerospace Systems Personnel Protection.

Descriptors: (*Shielding, Space environmental conditions), (*Mathematical analysis, Shielding), Programming (Computers), Space flight, Solar flares, Protons, Radiation hazards, Cosmic rays, Van Allen radiation belt, Spacecraft, Solar wind, Orbital trajectories, Lunar trajectories, Models (Simulations).

The purpose of this study was to develop mathematical methods to assess the biological hazards of space radiation and to program these methods for the IBM 7090 using FORTRAN language. A semi-analytical approach was utilized to write machine programs for geocentric trajectories and a model astronaut inside a space vehicle. The trajectory program is used to solve the two body problem with pertubations to correct for the oblateness of the earth. The earth's magnetosphere is the space of principle interest for lunar missions, therefore lunar impact and return trajectories are considered to be two body geocentric orbits. An astronaut's head and torso are represented by two right elliptical cylinders. This model is placed inside a mathematically described space vehicle with known thicknesses in designated areas. An existent machine program was utilized to define the radiative environment in McIlwain (B,L) coordinates and supplemental computer programs were used to determine radiation doses resulting from electron and proton environments. Results from the CARS program are obtained with a small amount of maching time. For example, one tenth (.1) of an hour was required to determine the radiation

dose due to two spectra (electrons and protons) at ten points in the model astronaut within the APOLLO Command Module (CM) for a given orbital mission. (Author)

AD-435 885 Div. 20, 7
OTS price $14.00

Radio Corp. of America, Lancaster, Pa.
THE DEVELOPMENT OF A LOW-TEMPERATURE VAPOR-FILLED THERMIONIC CONVERTER FOR NUCLEAR APPLICATIONS.
Summary technical rept., 9 Oct 62-30 Sep 63, by W. E. Harbaugh and R. J. Buzzard. Jan 64, 206p.
Contract NObs84823, Proj. SF013 0624, Task 2853
Unclassified report

Descriptors: (*Thermionic converters, Nuclear energy), (*Energy conversion, Electric power production), Life expectancy, Performance (Engineering), Design, Configuration, Uranium compounds, Oxides, Effectiveness, Materials, Electrodes, Cesium, Compatibility, Tests, Equations, Cleaning, Ceramic materials.

Modifications to improve the performance and extend the life of the A-1197A converter were made on the basis of information obtained in performance and life tests and a detailed computer analysis. A new nuclear-fueled converter, the RCA Development Type A-1272, was designed. In tests this converter produced more than 10 watts per square centimeter of emitter area. As a result of the experiments with electrically heated converters, the basic principles governing the behavior of series- and parallel-connected converters were defined, mathematical expressions for these basic principles were developed, a method was devised for designing converter systems for use in a reactor and computer programs were prepared that will predict the performance of such systems of converters. (Author)

AD-435 902 Div. 20
OTS price $3.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
QUASI-PARTICLE LIFETIMES BY GREEN'S FUNCTION METHOD, AND QUANTUM THEORY OF DOMAIN-WALL MOTION, by James F. Janak. Mar 64, 31p. Technical rept. nos. 186; 187
Contract Nonr184110, Proj. NR018 801
Unclassified report

Descriptors: (*Bosons, Life expectancy), (*Field theory, Green's function), Statistical mechanics, Quantum statistics, Mesons, Fermions, Nuclear scattering, Energy, Matrix algebra, Integral transforms, N-body problem, Perturbation theory, Nuclear spins, Damping, Ferromagnetism, Crystals, Magnetic fields, Ground state, Resonance, Hamiltonian, Harmonic oscillators.

AD-436 085 Div. 20, 18
OTS price $6.60

Technical Military Planning Operation, General Electric Company, Santa Barbara, Calif.
ENTRAINMENT AND EXPANSION CONTROLLED FIREBALL RISE,
by Gerhard Rohringer. 1 July 63, 62p. Rept. no. RM63TMP25
Contract DA49 146XZ038
DASA 1409 Unclassified report

Descriptors: (*Nuclear explosion, Thermal radiation), Spheres, Pressure, Low altitude, Stabilization, Buoyancy, Cooling, Mathematical analysis, Density, Weight, Temperature, Distribution, Equations, Heat transfer, Velocity, Earth, Atmosphere.

This paper reports on a detailed analysis of the buoyant rise of fireballs in the earth's atmosphere. Formulae for the rise velocity and height, and the density, mass, radius and expansion velocity of the fireball are given. The computation of fireball temperature is discussed in detail; no explicit expression could be given because of the nature of the problem. The assumptions and simplifications on which the analysis rests are summarized in a separate section. In order to facilitate applications, a complete numerical example is given. Frequently used quantities are calculated and presented in graphical and tabular form. (Author)

AD-436 183 Div. 20
OTS price $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
DOSE MEASUREMENTS FOR NEUTRON STREAMING IN DUCTS, by D. R. Doty. 26 Mar 64, 40p.
Proj. Y F008 08 05 201
NCEL TR R 282; DASA 11 026
Unclassified report

Descriptors: (*Neutron flux, Measurement), (*Duct inlets, Shelters), Ventilation ducts, Shielding, Nuclear physics, Fast neutrons, Dose rate, Radiation measurement systems, Dosimeters.

The purpose of this report is to describe an operating facility and present some preliminary findings concerning the streaming of neutrons in ducts of protective shelters. The experimental results are compared to a simplified theoretical treatment using the albedo approach. Dose measurements were obtained in a 3 x 3-foot concrete duct for thermal, 2.5-Mev, and 14.7-Mev neutrons using a 12-inch spherical energy-independent dosimeter. In the second leg, for all energies, the dose was found to have a higher drop-off than the theory predicted. Reasons for the discrepance are examined and a comparison of effective albedos is made for various energies. (Author)

AD-436 311 Div. 20
OTS price $3.60

Technical Operations, Inc., Burlington, Mass.
ANGULAR DISTRIBUTION OF SKYSHINE RADIATION AT THE SURFACE OF A PLANE OF FALLOUT CONTAMINATION, by Albert W. Starbird and John F. Batter.
Mar 64, 37p. Rept. no. B63 40
Contract OCD OS62 14
Unclassified report

Descriptors: (*Radioactive fallout, Distribution), (*Radiation measurement systems, Radioactive fallout), Angle of arrival, Radiological contamination, Radiation monitors, Detectors, Dose rate, Scattering, Collimators, Gamma rays, Nuclear physics.

An experimental program was conducted to determine the angular distribution of the air-scattered component of gamma radiation (skyshine) at the surface of a plane of fallout contamination. Measurements were made by placing a radiation detector in a vertical collimator recessed flush with the ground surface and placing cobalt-60 sources on the ground along a line extending from the center of the collimator to a radius of about 40 ft to simulate fallout contamination. Detector depth in the collimator was varied to measure skyshine within the cone formed by the collimator opening and the detector at given solid angle fractions for source positions ex-

tending from the collimator lip to the 40-ft radius. The experimentally-determined results of this program and of other investigators were compared with theoretical calculations. (Author)

AD-436 391 Div. 20, 16
OTS price $5.50

Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.
SECONDARY MISSILES GENERATED BY NUCLEAR-PRODUCED BLAST WAVES,
by I. Gerald Bowen, Mary E. Franklin, E. Royce Fletcher and Ray W. Albright. 28 Oct 63, 479p.
Proj. 33 2
AEC WT1468 Unclassified report

Report on Operation PLUMBBOB.

Descriptors: (*Nuclear explosions, Fragmentation), (*Blast, Fragmentation), Detonations, Velocity, Ranges (Distance), Nuclear explosion damage, Glass, Gravel, Casualties, Nuclear warfare casualties, Hazards, Test methods, Explosion effects, Tissues (Biology), Tumbling.

The generation of secondary missiles by blast waves was investigated in Operation Plumbbob for three nuclear detonations with estimated yields of 11, 38, and 44.5 kt. A trapping technique was used to determine the impact velocities for 17,524 missiles (stones, glass fragments, spheres, and military debris or steel fragments) which occurred in open areas, houses, and an underground shelter with an open entryway. The equivalent ideal-wave peak overpressures computed from measured blast data for the open-area stations varied from 3.8 to 21 psi. Two houses and an underground shelter were located where the overpressures were 3.8 and 65 psi, respectively. The effect of hill-and-dale terrain on the production of missiles was investigated on one of the shots. Precursor effects were noted on two of the shots at stations near ground zero. Missile velocities measured at all stations except the underground shelter were compared with those computed by use of a model based on an ideal blast wave. An analytical procedure was presented by which translational velocities of man can be estimated using the measured velocities of spheres and stones. Total distances of displacement were measuref for 145 stones that weighed up to 20 kg and for 1528 fragments from a concrete-block wall. (Author)

AD-436 428 Div. 20, 25
OTS price $4.60

Carnegie Inst. of Tech., Pittsburg, Pa.
NUCLEAR DEFORMATIONS IN THE PAIRING-PLUS-QUADRUPOLE MODEL I. THE SINGLE-j SHELL,
by Michel Baranger and Krishna Kumar. Mar 64, 43p.
TR15
Contract Nonr760 15, Proj. NR024 439
Unclassified report

Descriptors: (*Nuclear shell models, Quadrupole moments), (*Nuclear structure, Deformation), Perturbation theory, Nuclear energy, Nuclear moments, Probability, Hamiltonian, Operators (Mathematics), Nuclear particles.

The motivation and basic assumptions of the pairing-plus-quadrupole model are reviewed. Analytical and numerical applications are made to the single-j shell, demonstrating the competition between the deforming effect of the quadrupole force and the spherifying effect of the pairing force. When it is deformed, the single-j shell is always axially symmetric. Cases are found for which the potential energy of deformation has a spherical minimum and a deformed minimum simultaneously. The results are valid for any j. The importance of zero-point motion is studied and is found to decrease with increasing j. (Author)

AD-436 470 Div. 20
OTS price $3.60

General Electric Co., Santa Barbara, Calif.
PROPERTIES OF BALLISTIC FIREBALL RISE,
by Gerhard Rohringer. 1 Jul 63, 35p. Rept. no. RM631MP26
Contract DA49 146XZ038
DASA 1410 Unclassified report

Descriptors: (*Nuclear explosions, Ballistics), (*Air burst, Explosion bubbles), Atmosphere, Density, Temperature, Air, Numerical analysis, Acceleration.

The processes leading to ballistic rise are analyzed. Formulae for the computation of ballistic rise speeds are given. Expansion during ballistic rise is discussed qualitatively. The settling of neutral debris is computed in detail. (Author)

AD-436 749 Div. 20
OTS price $13.50

Stanford Research Inst., Menlo Park, Calif.
RADIOLOGICAL MONITORING: CONCEPTS AND SYSTEMS,
by Richard B. Bothun and Richard K. Laurino.
Feb 63, 192p.
Contract OCD OS62 135
Unclassified report

Descriptors: (*Radiation measurement systems, Civil defense systems), (*Civil defense systems, Radiation measurement systems), (*Radioactive fallout, Hazards), Shelters, Radiation monitors, Costs, Survival, Recovery, Radiological dosage, Site selection, countermeasures, Effectiveness, Nuclear warfare, Communication systems.

Guidelines for design of radiological monitoring systems were developed from an analysis of the radiological information requirements over time of the principal organizational elements of civil defense, with respect to the emergency and recovery phases. Constraints on the design criteria of both fixed and mobile systems were defined as dictated by the information which they must provide. Fixed monitoring systems were studied with respect to station spacing, intensity reporting levels, accuracy of equipment, and related design specifications. The operational constraints and the techniques of deployment of mobile systems were also considered. Specifications of instrument accuracy were developed from considerations of both the accuracy with which dose can be related to the biological effect and the precision of radiological information required to support civil defense operations. The functions of monitoring instruments within shelters were reviewed, and their requirements for accuracy and range were developed. Initial investment and annual operating costs were estimated for selected systems. (Author)

AD-437 253 Div. 20, 16
OTS price $6.60

Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.
TENTATIVE BIOLOGICAL CRITERIA FOR ASSESSING POTENTIAL HAZARDS FROM NUCLEAR EXPLOSIONS.
Technical progress rept.,
by Clayton S. White. Dec 63, 61p.
Contract DA49 146XZ055
DASA 1462 Unclassified report

Descriptors: (*Nuclear explosions, Hazards), (*Blast, Tolerances (Physiology)), Biophysics,

Therapy, Casualties, Detonation waves, Exposure, Survival, Thresholds (Physiology), Ear, Thermal radiation, Clothing, Burns, Radiation sickness, Surface burst.

Available, but tentative and incomplete biological criteria of use in assessing human hazards from nuclear explosives, were presented along with the source of data from which they were derived. The criteria were related to effects parameters employing free-field, some geometric, and translational scaling to the end that areas at potential risk from nuclear detonations ranging in yield from one kt to 100 Mt could be estimated. The problem areas involved, and many uncertainties due to lack of both physical and biological data as well as the conditions of exposure, represent a major factor in determining the environmental variations that challenge man and in controlling the incidence of casualties and survival were noted and discussed. Utility of the range-yield-effects relationships set forth was emphasized as was the need for a continued collaborative effort between biologically and physically oriented personnel to improve understanding biological response and basic effects phenomenology. (Author)

AD-437 254 Div. 20
OTS price $2.60

United Research Services, Burlingame, Calif.
STUDY OF FACTORS INFLUENCING REMEDIAL MOVEMENT,
by Myron B. Hawkins. 17 Apr 64, 23p. Rept. no. 638 2
Contract OCD PS64 20, Task 3221A
Unclassified report

Descriptors: (*Radioactive fallout, Countermeasures), Civil defense systems, Shelters, Transportation, Radiation injuries, Radiological dosage, Shielding, Survival, Feasibility studies.

The feasibility of remedial movement, i.e., transfer of people from inadequate fallout shelters to areas providing greater protection, was investigated. Within the limitations imposed by the conditions of the study, certain conclusions were drawn: (1) As might be expected, the maximum opportunities for payoff are related to refuges having lower protection factors. (2) Maximum payoff conditions are related to fallout arriving at early times. (3) Maximum payoff conditions generally involve reference radiation intensities of 350 r/hr or greater, with the upper limit of about 2000 r/hr. (4) For one-hour arrivals the maximum allowable travel time for maximum payoff is about 1.3 hours. (Author)

AD-437 514 Div. 20
OTS price $1.10

Massachusetts Inst. of Tech., Cambridge.
DETERMINATION OF INTERMOLECULAR POTENTIALS FROM MOLECULAR BEAM SCATTERING.
Status rept. no. 20, 1 Jan-5 Apr 64,
by I. Amdur, Michael C. Fowler, John E. Jordan, Alvin B. Marcus and John W. Meriwether, Jr.
6 Apr 64, 4p.
Contract Nonr1841 23
Unclassified report

Descriptors: (*Elastic scattering, Research program administration), Molecular beams, Universities, Molecular properties.

AD-437 662 Div. 20
OTS price $1.60

Cornell Univ., Ithaca, N. Y.
RADIATIVE PION-NUCLEON SCATTERING,
by P. Carruthers. Nov 63, 19p.
Contract Nonr40151
Unclassified report

Descriptors: (*Nuclear scattering, Pions), (*Pions, Nuclear scattering), Nucleons, Bremsstrahlung, Photons, Nuclear cross sections, Nuclear reactions, Nuclear particles, Theory.

The cross section for bremsstrahlung in pion nuclear scattering is calculated from the results of the static nucleon theory. The result agrees well with a recent measurement of the reaction pi(+) + p = pi(+) + p + gamma at an average pion laboratory kinetic energy of about 300 Mev. The theoretical result is .25 mb. The energy distribution of the final pion is computed at laboratory energies of 200, 300, and 400 Mev. The 3-3 isobar shows up clearly at the latter two energies, in agreement with experiment. Experiments are suggested whereby the bremsstrahlung can be used as a probe to obtain information about the higher resonances in pion-nucleon scattering. (Author)

AD-437 832 Div. 20
OTS price $13.00

Burns and Roe, Inc., New York.
FEASIBILITY STUDY OF NUCLEAR POWER FOR DISASTER CONTROL AND CONSTRUCTION BATTALION OPERATIONS.
8 Jul 63, 190p. Rept. no. WO2161 01
Contract NBy45824
Unclassified report

Descriptors: (*Nuclear power plants, Feasibility studies), Naval operations, Amphibious operations, Feasibility studies, Costs, Shielding, Vulnerability, Reactor hazards, Maintenance, Mobile, Transportation, Vibration, Noise, Energy conversion, Gas-cooled reactors, Thermionic converters, Liquid metal cooled reactors, Rankine cycle.

This report presents the results of a study of the feasibility of nuclear power plant application to beachhead operations by the military. The object of the study is to provide a general plant description, an assessment of the feasibility of the application, a cost estimate, recommendations on power generation methods and technical plant requirements. (Author)

AD-437 833 Div. 20
OTS price $9.60

Burns and Roe, Inc., New York.
FEASIBILITY STUDY FLOATING MOUNT NUCLEAR POWER PLANT.
8 Nov 63, 114p. Rept. no. WO216 01
Contract NBY45824
Unclassified report

Descriptors: (*Nuclear power plants, Feasibility studies), Shipborne, Costs, Shielding, Vulnerability, Reactor hazards, Design, Nuclear reactors, Floats.

The purpose of this report is to present the state-of-the-art with regard to nuclear power technology for use as the primary energy source in a 20,000-kwe (net) power plant mounted on a non-self-propelled barge. In order to evaluate the economic feasibility of the nuclear power plant, the comparable cost for conventional fossil-fuel-fired plant is also presented. This report includes descriptions of the advanced and present-day reactor concepts together with conceptual drawings, construction cost estimates, design and construction schedule, and estimates of annual fuel, operating and maintenance costs. (Author)

AD-437 860 Div. 20
OTS price $5.60

IIT Research Inst., Chicago, Ill.
RADIATION STREAMING IN DUCTS AND SHELTER ENTRANCEWAYS.
Final rept., July 61-Mar 62,
by C. W. Terrell, A. J. Jerri and R. O. Lyday, Jr.
Apr 62, 58p. Rept. no. 1158A02 7
Contract NBy3185

Unclassified report

Descriptors: (*Radiological contamination, Shelters), (*Ventilation ducts, Radiation hazards), Attenuation, Gamma rays, Thermal neutrons, Configuration, Concrete, Shielding, Dose rate, Radiation measurement systems, Distribution, Detectors.

This program is an analytical and experimental investigation of the streaming of gamma and neutorns through ducts and personnel shelter entranceways. The attenuation of gamma rays in concrete walled ducts having two right angle bends was measured. Both Z and U shapes were studied experimentally. The addition of a second right angle bend results in a large increase in the attenuation for gamma rays and the energy dependence of the attenuation is considerably reduced. For smaller ducts of cross section 1 by 1 foot, the attenuation of the second bend is far greater than for the larger cross section entranceway. (Author)

AD-437 878 Div. 20
OTS price $1.60

Bendix Systems Div., Bendix Corp., Ann Arbor, Mich.
RADIATION EFFECTS PARAMETERS IN NAP APPLICATIONS.
Monthly progress letter no. 5 for Dec 63.
16 Jan 64, 18p. Rept. no. BSR 847
Contract AF29 601 5911

Unclassified report

Descriptors: (*Neutron spectrum, Radiation effects), (*Test reactors, Radiation damage), Measurement, Fast neutrons, Dose rate, Test facilities, Instrumentation, Gamma-ray spectrum, Cobalt, Nuclear reactor, Tests, Thermal neutrons, Isotopes, Detectors, Foils, Shielding, Materials, Indium, Gold, Iodine, Manganese, Vanadium, Chlorine, Fission neutrons, Boron, Plutonium, Neptunium, Uranium, Nickel, Phosphorous, Magnesium, Sulfur, Aluminum, Silicon.

21. NUCLEAR PROPULSION

AD-436 083 Div. 21, 27
OTS price $3.60

Plasma Lab., Columbia U., New York.
ON A GASEOUS NUCLEAR ROCKET WITH MHD VORTEX FUEL CONTAINMENT,
by K. O. Kessey and R. A. Gross. Oct 63, 37p.
Rept. no. 6
Contract AF49 638 1254
AFOSR 64 0570 Unclassified report

Descriptors: (*Nuclear propulsion, Rocket motors), Gaseous rocket propellants, Magnetohydrodynamics, Vortices, Uranium, Hydrogen, Separation, Centrifugal fields, Velocity, Electric currents, Equations, Gas flow, Nuclear reactors, Physical properties, Transport properties, Plasma medium, Reactor power density, Enthalpy, Reynolds number, Performance (Engineering), Radioactive isotopes, Kinetic theory.

The use of a hydromagnetically driven vortex as a means of separating fuel from propellant in a gaseous nuclear rocket is examined for configurations of practical interest. Theoretical limitations are given on the radial mass flow rate for steady flow. The simultaneous compatible conditions of electric power, magnetic field strength, fuel-propellant composition (Uranium 235 as fuel and Hydrogen as propellant) and inlet composition are determined for steady separation in a critical system. Transport properties are estimated at 1 ev using kinetic theory. Reactor power requirements and thrust produced by several systems are determined. (Author)

22. ORDNANCE

AD-435 749 Div. 22
OTS prioe $1.60

Naval Ordnance Test Station, China Lake, Calif.
TWO-ROUND ZUNI LAUNCHERS FOR F-8 AIRCRAFT.
Rept. for Sep 62-Sep 63,
by Vince Taylor. Feb 64, 10p.
NOTS TP3212, NAVWEPS 8122
Unclassified report

Descriptors: (*Rocket launchers, Airborne), Aircraft ammunition, Jet fighters, Air-to-surface, Tests, Construction, Damage, Rockets.

Experience at the U. S. Naval Ordnance Test Station with the LAU-33/A and LAU-35/A launchers is discussed. These launchers, which are used for firing Zuni rockets from the F-8 series aircraft, add considerably to the firepower of the aircraft. The over-all concept is good; the launchers are lightweight and are easily handled and easily loaded; and pilots have good results as far as accuracy is concerned. A few minor discrepancies have been found, however, and recommendations for modifications to the launchers are made. (Author)

AD-435 785 Div. 22
OTS price $1.60

Ammunition Engineering Directorate, Picatinny Arsenal, Dover, N. J.
COMPATIBILITY OF A RIGID POLYURETHANE FOAM WITH M17 PROPELLANT,
by Sydney Axelrod. Mar 64, 15p.
PA TR3158 Unclassified report

Descriptors: (*Propelling charges, Compatibility), (*Isocyanate plastics, Propelling charges), (*Expanded plastics, Propelling charges), High explosive ammunition, Ignition, Charges (Explosives), Projectiles, Howitzers, Compatibility, Guanidine nitrates, Storage, Heat.

During the development of the M86 Propelling Charge for the 175mm M437 Projectile, a central core ignition system was adopted. This system utilized perforated paper tubes to channel a flash from a base pad through the length of the propelling charge. The paper tubes occasionally left smoldering residue which was considered hazardous. Accordingly, a rigid polyurethane foam was substituted for the paper and was found to burn completely in the propelling charge. Subsequently, the rigid polyurethane composition was also of interest for use in central core ignition tubes in the XM51E1 Propelling Charge for the 155mm T255 and T258 Howitzers. The propelling charge consisted of M17 Propellant. Compatibility of the propellant with the polyurethane was established. (Author)

AD-435 847 Div. 22
OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
FIXED-WEIGHT AND FIXED-VOLUME CONSTRAINTS ON OPTIMUM CHARGE-TO-METAL RATIOS IN WARHEAD DESIGN,
by Robert G. S. Sewell. Mar 64, 13p.
NOTS NAVWEPS TP3430; 8471
Unclassified report

Descriptors: (*Charges (Explosive), Warheads), (*Warheads, Fragmentation ammunition), Energy management, Weight, Volume, Optimization.

A simplified method of determining optimum charge-to-metal ratios in warheads under the design limitations imposed by either a fixed weight or a fixed volume is discussed. Equations are developed for optimum ratios for producing maximum momentum, energy, or another function of mass and velocity for two charge geometries. Curves of these functions, showing behavior in the vicinity of the maxima, are presented. (Author)

AD-435 868 Div. 22, 20
OTS price $10.10

IIT Research Inst., Chicago, Ill.
FIRE AND IMPACT TESTS, JOINT AEC-DOD VULNERABILITY PROGRAM (WEAPON IMPACT TESTING USING ROCKET SLEDS).
Final rept. June 59-June 63,
by J. E. Kennedy, L. A. Gardiner, D. J. Hrdina and E. H. Scharres. Mar 64, 130p.
Contract AF29 601 1959, Proj. 8809
AFSWC TDR62 132, vol. 5, pt. 1, DASA 1276
Unclassified report

Descriptors: (*Rocket propelled sleds, Test equipment), (*Weapons, Hazards), Rocket propelled sleds, Detonation, Weapon systems, Velocity, Tests, Concrete, Targets, Warheads, Telemeter systems, Instrumentation, Test equipment, Diaphragm, Accelerometers, Calibration, Vulnerability, High explosive ammunition, Photography, Deceleration, Blast, Storage, Operation, Transportation, Fire, Nuclear weapons, Impact shock, Test methods, Environmental tests.

Thirty-two weapon impact tests were conducted using expendable rocket sleds to propel the weapon systems into the impact area. The objective was to determine the minimum impact velocities required to cause detonation of the

high-explosive elements of various weapons. Test conditions which represented a most severe foreseeable impact situation were chosen; each weapon, in its most vulnerable attitude, impacted a massive target with a concrete slab face. The slabs were suspended over the sled track rails on a target structure which straddled the rails, such that the weapon impacted the target slab fully while the rocket sled passed freely beneath the target structure. This experimental technique produced clean weapon impacts, to which weapon responses were self-consistent and reproducible. Interpretation of the instrumentation information which was obtained permitted a quantitative analysis of the impact phenomena in a majority of the runs. (Author)

AD-435 870 Div. 22, 23
OTS price $9.60

Naval Ordnance Test Station, China Lake, Calif.
MODEL 5 TRACKER AND PROFILE PLOTTER, SKYSCREEN TELESCOPES, AND ASSOCIATED ELECTRICAL EQUIPMENT DESCRIPTION, OPERATION, AND MAINTENANCE (A PRELIMINARY MANUAL).
Feb. 64, 112p.
NOTS TP3330 Unclassified report

Descriptors: (*Navigator-bombardiers, Training devices), (*Training devices, Bombing), Circuits, Instruction manuals, Optical tracking, Binoculars, Reticles, Plotters, Vacuum apparatus, Time switches, Hydraullc systems, Control systems, Photomultipliers, Timing devices, Maintenance.

AD-435 872 Div. 22
OTS price $1.60

Feltman Research Lab., Picatinny Arsenal, Dover, N.J.
FEASIBILITY STUDY OF SOLID STATE SAFETY ARMING DEVICE FOR SQUIBS,
by Ronald M. Grogan and Paul J. Kisatsky.
Apr 64, 16p.
DA Proj. 1A0130 01A039
FRL TM1244 Unclassified report

Descriptors: (*Arming devices, Explosives initiators), Transistors, Semiconductor devices, Electric detonators, Safety devices.

The purpose of this investigation was to determine the feasibility of using the field-effect transistor as a safety device to short out electrically activated squibs before they receive a firing pulse. The results of this study indicate that the present state of the art of field-effect transistor technology is not sufficiently advanced for the necessary device to be feasible or practical. (Author)

AD-435 969 Div. 22
OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
THE DEVELOPMENT OF A STAB-INITIATED, HERMETICALLY SEALED DELAY DETONATOR (DETONATOR WOX-58A),
by Howard S. Leopold. 30 June 61, 20p.
NOL TR61 62 Unclassified report

Descriptors: (*Detonators, Depth bombs), Seals (Stoppers), Hermetic seals, Tests, Arming devices, Design, Delay elements (Ordnance), Temperature, Humidity.

A stab-initiated, hermetically-sealed, delay detonator has been developed for use in the Depth Charge WOX-3A. This detonator has an overall length of 2.303 in. and a diameter of 0.500 in. It has a nominal delay, at room temperature, of 5.3 seconds with a standard deviation less than 0.09 second. It operates reliably over the temperature range -65 F to +160 F with an average delay time variation changing from 5.7 to 5.0 seconds. Its design is such that the delay composition. It produces an average mils with a standard deviation less than 0.39 mils. It passes the environmental tests: MIL-STD-300, MIL-STD-301, MIL-STD-304, MIL-STD-305, MIL-STD-353, and TN 1441-Via. It fails to pass environmental tests MIL-STD-302 (forty-foot drop); but, since there is an interruption system between this detonator and the main charge, this does not rule out use of the detonator in the Depth Charge WOX-3A. (Author)

AD-436 025 Div. 22
OTS price $12.00

Minneapolis-Honeywell Regulator Co., Hopkins, Minn.
AIR DELIVERED AREA DENIAL WEAPONS. VOLUME II - EMPLACEMENT STUDIES.
by Ben F. Hardaway. Apr 64, 164p.
Contract AF08 635 3070, Proj. 2510
ASD TDR63 887, vol 2 Unclassified report

Descriptors: (*Projectiles, Penetration), (*Penetration, Soils), Clay, Sand, Geometric forms, Terminal ballistics, Shale, Configuration, Trafficability, Mathematical models, Transformations (Mathematics), Soil mechanics, Weapons, Airborne.

Under Modification No. 1 of the subject contract, Honeywell is conducting an applied research study program as described in Volume I (classified) of this report. A portion of this study is devoted to analytical and emprical investigation of the phenomenon associated with ground penetration by impacting vehicles; this document presents the study results to date. Work performed encompasses the development of analytic methods for the predication of impact and penetration phenomenon, and the performance of a parametric test program to augment esixting data. (Author)

AD-436 395 Div. 22
OTS price $2.60

Watervliet Arsenal, New York.
DYNAMIC AND STATIC ANALYSIS OF STRAINS IN BREECHBLOCK COMPONENTS OF LARGE CALIBER WEAPONS,
by R. E. Weigle. Oct 63, 23p.
Proj. 1F5 23801A289 01
WVT RR6314 Unclassified report

Descriptors: (*Strain (Mechanics), Breech mechanisms), Design, Statics, Dynamics, Gun components, Metal plates, Thickness, Stresses, Distribution, Howitzers, Experimental data, Artillery, Analysis, Mechanics, Loading (Mechanics), Theory, Mathematical analysis, Simulation, Pressure, Test equipment.

A technique for determining the stress distribution in thick plates is developed employing Timpe's solution and specializing it to the case of breechblocks utilized in large caliber howitzers and cannon. Static and dynamic strains are determined experimentally for the full scale breechblock and reasonable agreement is obtained. In all cases predicted values of strain were somewhat higher than those measured experimentally. It is concluded that useful design data can be obtained through use of the techniques described. It is further concluded from the observed static strain measurements that dynamic effects are negligible. (Author)

AD-436 404 Div. 22
OTS price $5.60

Hydronautics, Inc., Laurel, Md.
AN ANALYTICAL STUDY OF THE HYDRODYNAMIC PERFORM-

ANCE OF WINGED, HIGH-DENSITY TORPEDOES,
by C. F. Chen. Oct 63, 56p. TR349 1
Contract Nonr4083 00, Proj. NR277 004
Unclassified report

Descriptors: (*Torpedoes, Fluid dynamic properties), Wings, Drag, Lift, Mathematical analysis, Stability, Range (Distance), Hydrodynamic configurations, Performance (Engineering), Buoyancy.

The hydrodynamic performance of winged torpedoes has been investigated. It is assumed that the wing is mounted such that its center of pressure coincides with the center of gravity of the body, and that a ring-tail stabilizer is used. The resulting overall lift-drag ratios are presented as functions of the buoyancy-weight ratio. The ranges obtainable for the ascending, level, and descending flights are calculated. It is found that if the fuel weight is assumed to be always one-half of the displacement, winged torpedoes have longer ranges than those with neutral buoyancy only for descending missions. If the fuel weight, however, is assumed to be one-half of the total weight, the winged torpedo has longer ranges for all missions except steep ascending ones. (Author)

AD-436 599 Div. 22, 4, 3
OTS price $2.60

Naval Ammunition Depot, Crane, Ind.
INVESTIGATION OF MK 25 MOD 2 STARTER COMPOSITION,
by William Ripley. 25 Mar 64, 30p.
NAD CI RDTR36 Unclassified report

Descriptors: (*Explosives initiators, Pyrotechnics), (*Pyrotechnics, Chemical analysis), Dioxides, Lead compounds, Oxides, Copper compounds, Silicon, Stability, Ignition, Sensitivity, Impact shock, Electrostatics, Heat of reaction.

A study is made on various chemical and physical characteristics of the Mk 25 Mod 2 Starter Composition, which is an oxygen deficient silicon-lead dioxide → cupric oxide system. A scheme for chemical analysis, already provided in RDTR No. 27, is reviewed. Physical phase changes and chemical reaction mechanism of the compvents, and of the mixture as a whole are explored by differential thermal analysis and thermogravimetric analysis. The principal chemical reactions are considered and the theorectical thermodynamic values compared with experimental values. Behavior characeristics, such as sensititity, stability, heat of reaction, ignition point, and other available information are included in a Pyrotechnic Data Collection Sheet. (Author)

AD-436 656 Div. 22
OTS price $1.60

Ogden Air Material Area, Hill AFB, Utah.
SERVICE LIFE VERICATION TEST ON PRIMER, ELECTRICAL, HYDRAULIC POWER SUPPLY PART NUMBER 250016 AIM-4A SERIES (GAR-1D/2A),
by Clarence R. McGraw. Mar 64, 15p.
OOY TR64 783 Unclassified report

Descriptors: (*Electric primers, Life expectancy), (*Hydraulic actuators, Electric primers), Stability, Degradation, Hydraulic systems, Power supplies, Resistance (Electrical), Ignition lag.

Functional data were recorded on 2,166 primers of the 3,000 tested. The primers were over five years old. The manufacturer's data, date of manufacture, lot number, and other back-up information were not available. The primers functioned satisfactorily in all temperature groups. A definite trend of deterioration was noted as the conditioning temperatures were increased. The remaining 834 primers from the investigatior were subjected to electrical voltage changes, rapid temperaturing cycles, and prolonged temperature conditioning. The purpose was to rejuvinate the primers. The results, in general, did not develop a trend or produce unusual conditions. The results were within specification limits. The shelf and service lives were verified. The investigation proved deterioration was sufficient to limit the shelf and service life to a maximum five years. (Author)

AD-436 707 Div. 22, 8
OTS price $12.50

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
DEVELOPMENT OF BROAD-BAND ELECTROMAGNETIC ABSORBERS FOR ELECTRO-EXPLOSIVE DEVICES.
Final rept., July 62-Oct 63,
by Paul F. Mohrbach and Robert F. Wood. Oct 63, 75p. Rept. no. F B1981
Contract N178 8087
Unclassified report

Descriptors: (*Explosives initiators, Electromagnetic shielding), (*Electromagnetic shielding, Broadband), (Attenuators, Broadband), Attenuation, Absorption (Physical), Powder metals, Ferrites, Mathematical analysis, Metal coatings, Silver.

A representative number of ferrites are evaluated and attenuation values at frequencies of 500 kc to 500 Mc are given in table form. An equation expresses attenuation as a function of frequency, complex permeability, complex permittivity, and loss tangents. An increase in conductivity of the dielectric material can increase attenuation. A series of graphs is presented which show the conductivity of the theoretical models which were postulated. The effect of silvering the outside and inside diameters of toroids is discussed, and the changes in parameters as a result of silvering are plotted. Silvering cannot change the bulk parameters of the material but it does change the surface conductivity. Methods of measuring volume-resistivity and of choosing the coating technique for silvering ferrites are given. (Author)

AD-437 162 Div. 22
OTS price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
OBSERVATIONS OF CRATER GROWTH IN WAX,
by Lee S. Holloway. Oct 63, 19p.
RDT & E Prcj. 1M010501A009
BRL MR1526 Unclassified report

Descriptors: (*Cratering, Waxes), Hypervelocity projectiles, Velocity, Pressure, Projectile, Plastics, Waxes, Impact shock, Terminal ballistics, Compressive properties, Penetration, Radiography, Photographs, Flash radiography, Experimental data, Time, Light gas gun.

Radiographic observations of crater growth in wax under hypervelocity impact conditions are reported. At an impact velocity of 4km/sec, craters reached their maximum depth in about two hundred microseconds and subsequently rebounded to 60% of their maximum depth. (Author)

AD-437 564 Div. 22
OTS price $7.60

Army Frankford Arsenal, Philadelphia, Pa.
PROPELLANT ACTUATED DEVICES.

Bimonthly progress rept., Sep-Oct 63
Oct 63, 74p.
Proj. 5S 02 06 001
AFA 90 1 Unclassified report

Descriptors: (*Explosive actuators, Design), Research program administration, Feasibility studies, Propellants.

This is one of a continuing series describing the progress of certain development programs relating to propellant actuated devices (PAD) being conducted by Frankford Arsenal. The work covered includes the design and development of specific devices, such as thrusters, catapults, and initiators; investigations of related subjects, such as propellants and structural materials; and feasibility studies, aimed at improving the performance of propellant actuated devices and extending their application. (Author)

AD-437 574 Div. 22
OTS price $8.60

Miller Research Labs., Baltimore, Md.
PRODUCTION COMPONENTS FOR CARTRIDGE, 81MM ILLUMINATING XM-512.
Summary rept.,
by E. R. Briggeman. July 63, 94p. Rept. no. SR251 1 63
Contract DA36 034ORD3468RD
Unclassified report

Descriptors: (*Illuminating projectiles, Ammunition components), Performance (Engineering), Firing tests (Ordnance), Production, History, Design, Tests, Exterior ballistics, Failure (Mechanics), Costs, Aluminum.

AD-437 785 Div. 22
OTS price $3.60

Ammunition Engineering Directorate, Picatinny Arsenal, Dover, N. J.
AEROBALLISTIC STUDY OF THE 40MM SM385 PROJECTILE,
by Walter C. O'Keefe. Apr 64, 39p.
AED TM1395 Unclassified report

Descriptors: (*Aircraft guns, Feasibility study), Projectiles, Launching, Stability, Projectile trajectories, Exterior ballistics, Training ammunition, Moments, Mathematical analysis, Velocity.

A feasibility study was initiated by the Air Force to investigate the possibility of mounting the 40mm XM75 Launcher in a pod on a fixed wing aircraft. This increased the velocity of the firing platform from which the launcher must operate to 300 knots from the helicopter velocity of 140 knots. Although the XM385 Projectile has been successfully fired at 225 knots, a question was raised concerning the stability of the round at 300 knots. Because of the possibility of instability existing and the data available being insufficient to arrive at a definite conclusion, Picatinny Arsenal conducted a study of the XM385 Projectile's characteristics. (Author)

AD-437 823 Div. 22, 31
OTS price $6.60

Naval Ordnance Test Station, China Lake, Calif.
SHIPBOARD MEASUREMENT OF SYNCHRO AND OTHER FIRE-CONTROL SIGNALS ON DDG AND DLG TYPE SHIPS,
by G.S. Shriner. Feb 64, 62p.
NOTS TPR351 Unclassified report

Descriptors: (*Fire control systems, Signals), Fire control computers, Fire control system components, Noise, Shipborne, Test methods, Analog systems, Analog-to-digital converters, Digital systems, Frequency, Signals, Signal-to-noise ratio, Measurement, Amplifier, Recording systems, Voltage, Tests, Synchros, Gyro compasses, Stabilized platforms, Oscillation, Errors, Gun directors, Telemeter systems, Magnetic tape, Oscillographs.

Measurements were made on the Mk 74 and Mk 76 fire-control systems and the Mk 68 Mod 4 gun fire-control system to determine the frequency and noise distortion of the input signals to the fire-control computer. This report describes the test methods used and the results obtained aboard the USS Lynde McCormick, DDG-8, and the USS Mahan, DLG-11. (Author)

23. PERSONNEL AND TRAINING

AD-436 258 Div. 23
OTS price $9.10

Dunlap and Associates, Inc., Darien, Conn.
TRAINING ANALYSIS PROCEDURE (TAP) VOLUME II. HANDBOOK FOR APPLICATION,
by Charles E. Van Albert, Gabriel G. Jeantheau, Jack T. Gorby and Jack A. Parrish. Jan 64, 101p.
NTDC 1169 2 Unclassified report

Descriptors: (*Training, Handbooks), (*Handbooks, Training), Job analysis, Test methods, Performance tests, Time, Budgets, Training devices.

This handbook contains the procedural steps in the application of a technique known as Training Analysis Procedure (TAP). This method has been developed primarily for the use of Training Sutiation Analysis (TSA) teams of the Naval Training Device Center. The reader primarily interest in the methodological development is referred to Volume I. TAP is basically a procedure for utilizing information. TAP is a ranking of the tasks within a system in terms of the payoff of task training (as reflected by improved system operation) per training equipment dollar expended. Task performance is quantitatively defined, for purposes of TAP, in terms of the time required for the operator to perform the task and the probability that the task is performed accurately. Task training can influence either performance time, performance accuracy, or both. System improvement resulting from task training is defined as the percentage change in the number of successful system operations accomplished in a given length of time. The figure of merit adopted for a task is the improvement in system performance resulting from training for a given task. The selection of a task for incorporation into the system training environment is based on the highest ratio of a task's figure of merit to the cost of the equipment required to train for the task. TAP requires that certain kinds of information be developed by the TSA team. (Author)

AD-436 318 Div. 23
OTS price $1.10

Bureau of Naval Personnel, Washington, D. C.
NEW DEVELOPMENTS RESEARCH BRANCH STUDIES.
Rept. for Jan-Mar 64.
Mar 64, 5p.
Unclassified report

Descriptors: (*Naval personnel, Training), (*Military training, Naval personnel), Bibliographies, Weapon systems, Retraining, Performance tests, Human engineering, Personnel management, Maintenance personnel, Mine warfare, Guided missile personnel.

AD-437 246 Div. 23, 16
OTS price $1.60

Kent State U., Ohio.
PIERRE TEILHARD DE CHARDIN: A BIOLOGIST'S APPRAISAL,
by Charles G. Wilber. 1964, 11p.
Contract DA49 193MD2216
Unclassified report

Descriptors: (*Biology, Professional personnel), (*Professional personnel, Biology), (*Man, Theory), Paleontology, History.

AD-437 512 Div. 23
OTS price $1.60

TOR Education, Inc., Stamford, Conn.
LESSON WRITING FOR TEACHING VERBAL CHAINS: ORDER IN WHICH ELEMENTS ARE TAUGHT. PART IV: FORWARDS VS. BACKWARDS CHAINING,
by Charles W. Slack. Mar 64, 16p.
Contract Nonr397 200
Unclassified report

Descriptors: (*Learning, Analysis), (*Training, Analysis), (*Memory, Effectiveness), Education, Theory, Teaching machines, Psychology.

A poem was examined which had been previously programed by Gilbert according to rules of Mathetics at that time. The examination showed that an antithetical program could be produced by fading work elements for the first time in exactly the reverse order from that in which they were faded on the original program. The original program taught the program by retrogressive chaining. Word elements toward the end of the poem were faded in early trials and word elements toward the beginning of the poem were faded in later trials. In the antithetic program the reverse words toward the end of the poem were faded on later trials and words toward the beginning of the poem were faded on earlier trials. Results showed no difference between the two programs. One earlier study with different subject matter had produced essentially the same results. Other studies, including one with the same poem as subject matter, had disclosed Response Strength as a vital variable for consideration by programers. (Author)

AD-437 586 Div. 23
OTS price $6.60

Coordinated Science Lab., U. of Illinois, Urbana.
SELF-DIRECTED INQUIRY IN CLINICAL NURSING INSTRUCTION BY MEANS OF THE PLATO SIMULATED LABORATORY,
by Maryann Bitzer. 11 Dec 63, 67p. Rept. no. R 184
Contract DA36 039 AMC 02208E
Unclassified report

Descriptors: (*Nurses, Education), (*Education, Nurses), Personnel, Tests, Performance (Human), Performance tests, Instructors, Teaching machines, Training devices, Laboratories, Medical personnel, Medical technicians, Theory.

A portion of a medical-surgical nursing study unit was programmed for use on the PLATO system. It was presented to a group of student nurses, six students obtaining information by self-directed inquiry in the PLATO simulated laboratory and seven students in the control group attending their regular class with regular instructor. The experimental and control groups did not differ significantly on a pre-test of subject matter knowledge. A comparison of post-test results showed a difference in favor of the PLATO group that was significant at the .09 level. The value of experimenting was indicated by a correlation of .85 between the number of experiments the students performed and their post-test scores. The number of attempts at questions correlated -.75 with the post-test scores. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-435 548 Div. 24, 8
OTS price $6.60

Lion (Kurt S.), Belmont, Mass.
INVESTIGATION IN THE FIELD OF IMAGE INTENSIFICATION.
Final rept.,
by Kurt S. Lion and G. F. Vanderschmidt.
31 Jan 64, 69p.
Contract AF19 604 5704, Proj. 7661, Task 76612
AFCRL 64 133 Unclassified report

Descriptors: (*Image intensifiers (Electronics), Sandwich construction), Design, Theory, Photographic recording systems, Photoconductivity, Cadmium compounds, Sulfides, Electrical properties, Optical properties, Photographic emulsions, Electroluminescence, Phosphorescent materials, Photographic images, Solid state physics, Electric fields, Gas discharges.

The object of this study is an investigation of a solid state image intensifier consisting of a photoconductive layer and a photographic emulsion in an electric field. An incident radiation pattern produces a local conductivity of the photoconductive layer and causes a current pattern and a corresponding blackening in the photographic emulsion. Intensification in excess of 1000 were obtained at wavelengths between 800 and 850 millimicrons. The resolution is of the order of 100 to 300 microns. The intensification can be further improved by the use of thin layers of DC excited electroluminescent layers. The investigation shows that several physical effects contribute to the blackening of the emulsion. (Author)

AD-436 348 Div. 24
OTS price $8.10

General Electric Co., Schenectady, N. Y.
FEASIBILITY OF PHOTOPLASTIC RECORDING FOR ELECTROOPTICAL PHOTOGRAPHY,
Final rept., 9 July 62-28 Oct 63,
by S. Aftergut and J. Gaynor. Feb 64, 88p.
Contract AF30 602 2853, Proj. 5578, Task 557803
RADC TDR63 532 Unclassified report

Descriptors: (*Electrooptical photography, Photographic recording systems), Feasibility studies, Cathode ray tubes, Thermoplastics, Photographic film, Photoconductivity, Photographic images, Images, Display systems, Colors, Photographic projectors, Sensitivity, Photographic contract, Resolution.

Photoplastic Recording (PPR) is a photographic process i which images are recorded as surface deformations on a reusable photoconductive thermoplastic film. The image is developed instantaneously by heat and erased only by melting the film. The feasibility of updating information displayed by a cathode ray tube at least five times per minute was demonstrated. Sensitivity, resolving power, contrast and recording parameters such as film surface potential (for sensitization), thickness, and erasure condi-

tions were investigated. Images were schlieren-projected and image quality analyzed. Color projection of PPR images was studied. A PPR recorder was designed and constructed. Operating and servicing instructions are furnished. (Author)

AD-437 471 Div. 24, 18
OTS price $1.10

Chicago Aerial Industries, Inc., Barrington, Ill.
NIGHT ILLUMINATION SYSTEM FOR THE RF-101.
Monthly progress rept. no. 10, 20 Mar-20 Apr 64, by T. L. Thompson. 13 Apr 64, 3p.
Contract AF33 657 11511
Unclassified report

Descriptors: (*Night photography, Electronic flash), (*Electronic flash, Aerial photography), Airborne, Aerial reconnaissance, Illumination, Jet fighters.

AD-437 640 Div. 24, 12
OTS price $9.10

RCA Service Co., Inc., Patrick AFB, Fla.
PHOTOGRAMMETRIC DATA REDUCTION ANALYSIS CALIBRATION OF COMPARATORS FOR BALLISTIC CAMERA DATA, by Ralph A. Gugel. Dec 63, 101p. Rept. no. TR63 1
Contract AF08 606 5300
AFMTC TDR63 10 Unclassified report

Descriptors: (*Guided missile tracking systems, Photogrammetry), Tracking cameras, Ballistic cameras, Photographic plates, Stereoscopic map plotters, Calibration, Errors, Stereoscopes, Test methods, Tables, Optical tracking, Instrumentation.

The procedures for calibrating a precision leadscrew type comparator are described and the results of the calibration of the ballistic plate comparators in use at AMR are given. The errors to be calibrated are: (1) periodic leadscrew error, (2) scale error and secular leadscrew error, (3) weave and curvature of the ways and (4) nonperpendicularity of axes. The standard error of the plate coordinates obtained from Mann comparators 422C66 and 422D49 and Wild/Stereo Comparator STK-1 were reduced from 2.2, 4.9 and 5.2 microns to 1.2, 1.2 and 1.9 microns, respectively as a result of the calibrations. (Author)

AD-437 801 Div. 24, 30, 15
OTS price $6.60

Electronic Associates, Inc., Long Branch, N. J.
PHOTOGRAMMETRIC PLOTTER MODEL AS-9 (XW-1).
Final rept.,
by Edward J. Paschetto and Joseph A. Fornataro. June 63, 61p.
Contract AF30 602 2581, Proj. 5569, Task 556903
RADC TDR63 367 Unclassified report

Descriptors: (*Plotters, Photogrammetry), (*Photography, Mapping), Instrumentation, Numerical analysis, Design, Operation, Errors, Analysis.

The mathematical analysis, engineering design, and operating procedures, and error evaluation of the Model AS-9 (XW-1) Photogrammetric Plotter as designed and built by Electronic Associates, Inc. is treated. This equipment will rectify the geometric distortion in oblique and panoramic photography. The information to be rectified is manually traced and is then automatically plotted orthographically in ink or pencil. (Author)

AD-437 896 Div. 24, 18
OTS price $5.60

Aeroflex Labs., Long Island City, N. Y.
FLIGHT EVALUATION OF THE OLD DELFT IMAGE AMPLIFIER CAMERA FOR NIGHT AERIAL RECONNAISSANCE, by Richard P. Van Steenburgh. Mar 64, 55p.
Contract AF33 600 38437, Proj. 6220, Task 622005
RTD TDR63 4079 Unclassified report

Descriptors: (*Aerial reconnaissance, Night photography), (*Night photography, Electro optical photography), Aerial cameras, Image intensifiers (Electronics), Flight testing, Performance (Engineering), Moon, Stars, Light, Night sky, Illumination, Instrumentation, Installation, Operation, Effectiveness, Resolution, Photographic images, Surface targets, Photo interpretability, Aerial photographs, Photographic scale.

A two-stage image-amplifier system employing electrostatic focus and a 35 mm camera was evaluated for aerial reconnaissance photography under night ambient light conditions in the contractor's aircraft. Photographic density, tone reproduction, brightness gain and resolution were evaluated under various low light conditions, from starlight through bright moonlight, over a variety of terrain features and targets. The camera was found to be capable of producing negatives of normal density with 1/100 second exposures when the terrain was illuminated by dim moonlight, and of useable density with 1/2 second exposures under starlight conditions, using a fast panchromatic film such as Ansco Super Hypan. Image motion compensation and a stabilized camera mount are essential during the relatively long exposures. (Author)

25. PHYSICS

AD-435 140 Div. 25
OTS price $1.60

Rensselaer Polytechnic Inst., Troy, N.Y.
ENERGY SEPARATOR,
by J. V. Foa. Jan 64, 17p. Rept. no. TR AE 6401
Unclassified report

Descriptors: (*Energy, Separation), Enthalpy, Thermodynamics, Heat transfer, Jet mixing flow.

AD-435 158 Div. 25
OTS price $4.60

RCA Labs. Div., Radio Corp. of America, Princeton, N.J.
SOLID STATE LASER EXPLORATIONS.
Interim engineering rept. no. 1, 15 Oct 63-15 Jan 64,
by Z. J. Kiss, R. J. Pressley, F. Sterzer, T. Walsh, and J. P. Wittke. 1 Feb 64, 49p.
Contract AF33 615 1096
Unclassified report

Descriptors: (*Lasers, Solid state physics), Fluorescence, Rare earths, Calcium compounds, Impurities, Dysprosium, Fluorides, Microwave frequency, Measurement, Atomic energy levels, Samarium, Color centers, Absorption spectrum, Excitation, Strontium compounds, Chlorides, Crystal structure.

Studies of the excitation of trivalent rare earth ion lasers by cross-pumping in absorption bands associated with color centers in the host crystal were made using ErOF-CaF2. These indicate considerable promise for laser action. Hosts presenting a site of non-cubic symmetry for the fluorescent ions were also investigated. These included SrCl2 and various halofluorides. Such hosts have strong fluorescent transitions of the electric dipole type, and several show strong fluorescence at room temperature. SrCl2, however, shows a strong tendency to cleave under thermal stress. A method of chemically reducing trivalent dysprosium to the divalent state has been found and will be exploited in the futrue. The variation of wavelength and line width with temperature in CaF2:Dy2+ was determined, and this information was applied to several problems concerning laser operation. Frequency shifts of fluorescence and laser output with excitation level were correlated with thermal tuning effects, and threshold measurements with part of the laser crystal shielded were used to gain insight into basic processes. (Author)

AD-435 184 Div. 25
OTS price $1.60

General Electric Co., Schenectady, N. Y.
CONDENSATION AND ENERGY TRANSFER ON CRYSTALS,
by Bruce McCarroll and Gert Ehrlich. 20 Mar 63, 17p. Rept. no. 63RL3291M
Contract AF49 638 791
AFOSR 64 0776 Unclassified report

Descriptors: (*Crystals, Energy), Adsorption, Particles, Crystal lattices, Condensation, Atoms, Molecules, Tungsten, Crystal lattice defects, Impurities, Electron bombardment.

The collision of atoms with crystalline surfaces has an analogue in the semi-infinite linear chain of harmonically coupled particles struck on one end by an incident particle. Using this simple model, four different effects have been evaluated and compared with experiment: (1) the variation of the condensation efficiency with the mass of the impinging particle and with the strength of binding to the lattice; (2) the de-excitation of these atoms immediately after capture; (3) the efficiency of energy transfer to the lattice (accommodation coefficient) for collisions in which capture does not occur; and (4) the influence of defects on these quantities. (Author)

AD-435 185 Div. 25
OTS price $2.60

General Electric Co., Schenectady, N. Y.
AN ATOMIC VIEW OF ADSORPTION,
by Gert Ehrlich. Feb 64, 28p. Rept. no. 64RL3575M
Contract AF49 638 791
AFOSR 64 0777 Unclassified report

Descriptors: (*Adsorption, Scientific research), Electron microscopes, Electron microscopy, Experimental data, Vacuum apparatus, Solid state physics, Atoms, Condensation, Gases, Solids, Surfaces, Surface properties, Energy, Argon, Molybdenum.

Modern experimental techniques, particularly flash desorption, field emission, and field ion microscopy, coupled with advances in ultrahigh vacuum technology, have made it possible to attain a detailed description of adsorption phenomena from routine measurements. Recent advances in the understanding of elementary atomic processes at the gas-solid interface, gained by these methods, are reviewed with particular emphasis on two topics: (1) the relation between surface structure and atom binding in physical adsorption as well as the chemisorption; (2) the kinetics of atomic condensation and equilibration. (Author)

AD-435 425 Div. 25
OTS price $8.10

Catholic U. of America, Washington, D. C.
THE APPLICATION OF MOLECULAR ORBITALS TO THE STUDY OF SIMPLE MULTI-ATOMIC SYSTEMS.
Final rept. 1 June 53-31 Oct 63,
by Virginia Griffing. 31 Oct 63, 86p.
Contract Nonr1220 00
Unclassified report

Descriptors: (*Polyatomic molecules, Molecular spectroscopy), (*Reaction kinetics, Polyatomic molecules), (*Atomic orbitals, Polyatomic molecules), Carbon, Hydrogen, Helium, Ions, Beryllium, Wave functions, Diatomic molecules, Quantum mechanics, Electrons, Molecular properties, Hamiltonian, Operators (Mathematics), Lithium, Excitation, Ground state, Atomic energy levels, Configuration, Theory, Carbon.

Fundamental assumptions regarding the a priori value of the molecular orbital method in obtaining qualitative information about the chemical kinetics of interacting molecules are summarized. Application of these considerations to the H4 complex intermediate in the reaction of two H2 molecules, the hydrogen-halogen reactions, the linear H3 complex, and the interaction of Be and H2 is summarized. In addition, quantitative results for LCAO-MO-SCF studies of H4, H3, and He2 are discussed in the light of these considerations. LCAO-MO-SCF studies of NH, LiHe (LiHe+ and LiHe-), H2+, and H2 are summarized. (Author)

AD-435 469 Div. 25
OTS price $7.60

General Electric Co., Utica, N. Y.
FAILURE MECHANISMS AT SURFACES AND INTERFACES.
Interim technical documentary rept. no. 2, 1 Oct 63-1 Jan 64,
by K. K. Reinhartz, V. A. Russell, D. L. Stockman, W. J. vander Grinten and W. L. Willis. Mar 64, 75p. Rept. no. R63ELS75
Contract AF30 602 3085, Proj. 5519, Task 551906
RADC TDR64 35 Unclassified report

Descriptors: (*Failure mechanics, Surfaces), (*Surfaces, Failure mechanics), Measurement, Dielectrics, Capacitance, Low frequency, Voltage, Stresses, Temperature, Damage, Analysis, Triodes, Semiconductors, Theory, Desorption, Argon.

Analysis of the aging effects of thin film field effect devices, exposed to various temperatures in a dry argon atmosphere, with special emphasis on the transconductance g and the threshold voltage V, led to the following findings: (a) At 30 C both g and V are essentially invariant for more than 150 days. (b) At 76-121 C g remains constant to within 10-15%, while V reaches a new equilibrium value after from 10 days at 76 C to 3 days at 121 C. (c) The failure mechanism of (b) has been tentatively attributed to the desorption of water from the CdS-SiO interfacial region. Demountable thin film field effect devices were developed for the rapid investigation of different types of dielectrics. The study of electrical stresses, slow surface states and changes thereof uncovered various novel effects. (Author)

AD-435 480 Div. 25
OTS price $1.10

Naval Research Lab., Washington, D. C.
ANALYTIC FORMULAS FOR THE ACOUSTIC PRESSURE DISTRIBUTION BETWEEN A SPHERICAL TRANSDUCER AND A CONCENTRIC SPHERICAL BAFFLE.
Interim rept.,
by S. Hanish. 17 Jan 64, 9p.
NRL 6018 Unclassified report

Descriptors: (*Sound transmission, Pressure), Wave functions, Transducers, Boundary value problems, Spheres, Ship hulls, Ship noise, Acoustic impedance, Mechanical waves, Mathematical analysis.

A sphere having arbitrary distribution of normal velocity over its surface and surrounded (partially) by a spherical baffle board radiates sound into infinite space. In the region between the radiating sphere and the baffle board the resultant sound field consists of a set of incoming and outgoing waves described by an appropriate set of spherical wave functions. These functions are adjusted to yield a normal component of particle velocity distribution which matches the velocity distribution at the surface of the sphere. In the region outside the baffle the sound field corresponds to outgoing waves only. At the junction of the inner and outer regions over those portions of arc where no baffle exists the condition of continuity requires that pressures and particle velocities agree as the boundary is crossed. This requirement of continuity equates the infinite series of spherical wave functions in the outer region to an infinite series of different spherical wave functions in the inner region. The result is an infinite set of simultaneous equations in an infinite set of unknown expansion constants. Further treatment of these constants varies with the acoustic properties of the baffle. Baffles are considered which have surfaces of either zero pressure or zero normal components of particle velocity and the corresponding sets of equations are derived. A brief discussion is also made of the case where the baffle has an acoustic impedance which is neither zero nor infinite. (Author)

AD-435 498 Div. 25
OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
METHOD OF INVESTIGATING GLASS-CRYSTAL STRUCTURE,
by M. A. Bezborodov and A. M. Kripskiy. 10 Feb 64, 22p.
FTD TT63 796 Unclassified report

Trans. from Nauchnyye Trudy Belorusskogo Politekhnicheskogo Instituta, No. 82, pp. 3-15, 1960.

Descriptors: (*Crystal structure, Glass), Crystal growth, Crystallization, Nucleation, Petrography, Microscopy, Ultraviolet spectroscopy, Light, Diffusion, X-ray diffraction analysis, Analysis, Spectroscopy, USSR.

AD-435 501 Div. 25, 12
OTS price $6.60

Foreign Technology Div., Wright-Patterson AFB, Ohio.
MOTION OF A BODY OF VARIABLE MASS WITH CONSTANT AND DECREASING EXPENDITURE OF POWER IN A GRAVITATIONAL FIELD. PART III,
by G. L. Grodzovskiy, Yu. N. Ivanov and V. V. Tokarev. 10 Feb 64, 62p.
FTD TT63 973 Unclassified report

Trans. from O Dvizhenii Tela Peremennoy Massy S Postoyannoy I Ubyvayushchey Zatratoy Moshchnosti V Gravitatsionnom Pole. Chast' III, pp. 1-66.

Descriptors: (*Reentry vehicles, Motion), Differential equations, Boundary valve problems, Optimization, Orbital trajectories, Velocity, Inequalities, Gravity, Acceleration, Thrust.

AD-435 510 Div. 25
OTS price $1.10

Foreign Technology Div., Wright-Patterson AFB, Ohio.
ROLE OF ION VELOCITY DURING THE EXCITATION OF PLASMA OSCILLATIONS BY AN ION BEAM,
by M. D. Gabevich and G. S. Kirichenko.
19 Mar 64, 8p.
FTD TT64 115 Unclassified report

Trans. from Ukrainskiy Fizichniy Zhurnal 8:6 pp. 624-627, 1963.

Descriptors: (*Plasma oscillations, Excitation), Plasma medium, Ion beams, Velocity, Ions, Electrons, Energy, Probes (Electromagnetic).

AD-435 539 Div. 25
OTS price $3.60

Army Missile Command, Redstone Arsenal, Alabama
MILLIMETER TECHNIQUE EVALUATION OF GUIDANCE DATA ATTENUATION BY EXHAUST PLUMES,
by Augustus H. Green, Jr. 26 Mar 64, 37p.
DA Proj. 1B222901A204
AMC RA RE TR 63 31 Rev.
Unclassified report

Descriptors: (*Exhaust flames, Guidance), (*Radio signals, Attenuation), (*Millimeter waves, Attenuation), Electromagnetic waves, Theory, Communication equipment, Gas ionization, Rockets, Plasma medium, Propagation.

Maintaining re3iable communications between a missile in flight and ground-based communications equipment is a problem which is becoming more crucial as systems concepts and techniques advance and electromagnetic environment increases in complexity. A major difficulty encountered is signal loss caused by the ionization characteristics of the rocket exhaust (plasma). Many developmental systems, whether employing small or large motors, are affected by this pr6blem. The interaction of a plasma with an electromagnetic wave is related to three essential parameters: (1) the collision frequency of free electrons with neutral particles, (2) the free electron density, and (3) the frequency of the electromagnetic wave. The propagation constant is a function of the attenuation constant and the phase constant which are related to the three parameters. An analysis of these parameters is essential to achieving and understanding of signal propagation through a plasma. By measuring the attenuation constant and the phase constant at selected frequencies, the collision frequency and the electron density may be determined. (Author)

AD-435 540 Div. 25
OTS price $7.60

Air Force Cambridge Research Labs., Bedford, Mass
SPIN WAVE ANISOTROPY IN PARALLEL PUMPING EXPERIMENTS ON YIG,
by James C. Sethares, Marden H. Seavey, Jr. and Martin R. Stiglitz. Jan 64, 72p.
Proj. 5635
AFCRL 64 14 Unclassified report

Descriptors: (*Garnet, Anisotropy), Excitation, Yttridm, Iron, Phonons, X-band, Symmetry (Crystallography), Microwaves, Spectrum analyzers, Temperature, Equations, Motion, Ferrites, Propagation, Theory.

A theoretical and experimental investigation of magnetic anisotropy effects on spin wave excitation in parallel pumping experiments has been conducted. The experiments were performed at X-band frequencies on single crystal yttrium iron garnet. Anisotropy is introduced into the framework of existing theory. The spin wave dispersion relation and instability thresholds for pumping in a (110) crystallographic direction are derived. A number of experimental butterfly curves for various temperatures, crystallographic orientations, and geometries are obtained and compared with the theoretical predictions. A new effect, experimentally observable as an extra corner on the butterfly curves (separate from the phonon peaks), is shown to be directly related to the anisotropy produced splitting of the top of the spin wave band. (Author)

AD-435 571 Div. 25, 8, 30
OTS price $1.60

Microwave Lab., Stanford Univ., Calif.
RESEARCH AND INVESTIGATION OF SELECTED MICROWAVE PROBLEMS.
Interim engineering rept. no. 4, 1 Dec 63-29 Feb 64,
by M. Chodorow and C. F. Quate. Mar 64, 18p.
Rept. no. 1144
Contract AF33 657 11042
Unclassified report

Descriptors: (*Microwave equipment, Plasma oscillations), Theory, Ferrites, Acoustic properties, Excitation, Electromagnetic waves, Measurement, Probes (Electromagnetic), Electron beams, Spectrum analyzers, Light, Diffraction, Hypersonic characteristics, Lasers, Single crystals, Quartz, Sapphires, Cadmium compounds, Sulfides, Garnet, Magnetostriction, Cesium.

Theoretical and experimental solutions to basic microwave problems pursuant to providing means for generation and use of electromagnetic radiation in new realms of power, frequency, and purity are presented. This effort will emphasize unconventional devices and new ideas that show promise, but have not been adequately examined. (Author)

AD-435 601 Div. 25
OTS price $1.10

University of Southern Calif., Los Angeles.
VACUUM ULTRAVIOLET INDUCED FLUORESCENCE: A DIAGNOSTIC TOOL,
by D. L. Judge, A. L. Morse and G. L. Weissler. 28 Feb 64, 8p.
Contract AF19 628 2452, Proj. 7635, Task 763505
AFCRL 64 168 Unclassified report

Report on Photoionization and Photoionization-Induced Ion-Molecule Reactions.

Descriptors: (*Ultraviolet radiation, Fluorescence), Gas ionization, Ions, Vacuum, Photons, Ground state. Excitation.

AD-435 602 Div. 25
OTS price $2.60

University of Southern Calif., Los Angeles.
WAVELENGTH ANALYSIS OF FLUORESCENCE FROM GASES EXCITED BY VACUUM ULTRAVIOLET RADIATION,
by D. L. Judge, A. L. Morse and G. L. Weissler. 1 Aug 63, 26p.
Contract AF19 628 2452
Unclassified report

Descriptors: (*Gases, Fluorescence), (*Fluorescence, Gases), (*Ultraviolet radiation, Vacuum), (*Vacuum, Ultraviolet radiation), Pressure, Excitation, Energy, Analysis, Effectiveness, Instrumentation, Sparks, Air, Line spectrum, Photons, Monochromatic light.

A wavelength analysis and pressure dependence of the visible fluorescence of several gases will be presented. The excitation energy required to obtain fluorescence is discussed and estimates of the fluorescence efficiency. Excitation of the gases was obtained by allowing dispersed radiation from a condensed spark in air at 100 microns to enter a chamber containing the gas to be investigated. The source radiation consisted of a line spectrum from which photon energies between 12 and 24 ev were selected. With various of these source lines incident on the gas of interest, the wavelength analysis of the fluorescent radiation was obtained using a Tropel monochromator having a bandwidth of 100 Angstrom units. The low resolution of the Tropel was required in order to pass a detectable light flux through the instrument. These results represent an extension of those reported earlier. (Author)

AD-435 609 Div. 25
OTS price $2.60

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
LAMINAR HEAT TRANSFER OVER A MELTING PLATE - THE MODIFIED LEVEQUE PROBLEM,
by Yin-Chao Yen and Chi Tien. Jan 64, 24p.
Task 8X9 27 001 03
CRREL RR125 Unclassified report

Descriptors: (*Heat transfer, Mathematical analysis), (*Ice, Melting), Laminar flow, Fluid flow, Surfaces, Models (Simulation), Sea water, Velocity, Temperature, Ice islands.

Heat transfer in a system consisting of a fluid flowing over a melting plate composed of the same material as the fluid was investigated. The test model is similar to the heat transfer phenomenon occurring when an iceberg drifts in warm sea water. The flow of a liquid, initially at a uniform temperature, over a flat plate composed of the solid phase of the flowing liquid at constant temperature was assumed. For simplification of subsequent analysis the flow was stipulated as the Leveque type. The temperature distribution in the flowing fluid is determined; melting at the interface is shown to result in a decrease in the Nusselt number; consideration is given to the practical application of the results; and a simple numerical calculation of the melting rate of ice is given. (Author)

AD-435 616 Div. 25
OTS price $1.10

Clarendon Lab., Univ. of Oxford (England).
INFRA-RED ABSORPTION OF HYROGEN AND DEUTERIUM IONS IN CALCIUM FLUORIDE,
by W. Hayes, G. D. Jones, R. J. Elliott, and C. T. Sennett. 30 Jan 64, 9p. SR4
Contract AF61 052 677
AFCRL 64 284 Unclassified report

Descriptors: (*Infrared radiation, Absorption), (*Absorption, Infrared radiation), (*Hydrogen, Ions), (*Deuterium, Ions), (*Ions, Hydrogen), Calcium compounds, Fluorides, Vibration, Impurities, Spectrophotometer, Crystals, Fluorine, Gases, Measurement, Heat treatment.

An investigation has been made of the localized vibrations of hydrogen and deuterium ions present as impurities situated on the fluorine sites in calcium fluoride. (Author)

AD-435 617 Div. 25, 14
OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
ON THE USE OF MAGNETOSTATIC MODES FOR MEASURING SATURATION MAGNETIZATION OF FERRIMAGNETIC MATERIALS,
by Benjamin R. Capone. Jan 64, 17p.
Proj. 5621
AFCRL 64 49 Unclassified report

Descriptors: (*Ferromagnetic materials, Magnetic fields), (*Magnetic materials, Magnetic fields), Spin, Magnetic resonance, Garnet, Yttrium, Iron, Gallium, Excitation, Cryogenics.

The use of magnetostatic modes as a research tool has been suggested. Attempts to utilize this phenomenon for measuring the saturation magnetization of pure YIG samples and gallium substituted YIG samples show this method to be quite accurate for the narrow line width pure YIG material. However, in the measurement of gallium substituted YIG samples, difficulties were encountered in mode identification and interpretation of data. (Author)

AD-435 620 Div. 25
OTS price $10.10

Air Force Cambridge Research Labs., Bedford, Mass.
ON DETERMINATION OF THE OPTICAL ABSORPTION COEFFICIENT, II,
by Alfred Kahan. Dec 63, 125p.
Proj. 5621
AFCRL 63 325, vol. 2 Unclassified report

Descriptors: (*Dielectric properties, Optical properties), (*Optical properties, Reflection), Absorption, Measurement, Data, Tables.

The equation for the optical absorption coefficient alpha in terms of the average measured reflection and transmission coefficients r and T is derived. A set of tables of alpha d, where d is the sample thickness, as a function of T in intervals of 0.2% for parameters of r in 0.5% is included. Both r and T values range between 0 and 100 %. In addition, tables for the bulk reflectivity R as a function of r and T are given. (Author)

AD-435 628 Div. 25, 30, 24
OTS price $1.60

Land-Air Inc., Holloman, N. Mex.
TELESCOPE TUBE EFFECTS ON OPTICAL TURBULENCE. Final rept.
Jan 64, 20p. Rept. no. 64 1
Contract DA29 040AMC6R, ERDA Task 08 37, ROD RID Task 1 22 9
Unclassified report

Descriptors: (*Telescopes, Thermal properties), Pipes, Infrared lamps, Heat transfer, Air, Optical properties, Instrumentation, Measurement, Thermistors, Model tests, Photographs, Liquid cooled, Diffraction, Distortion, Optical images, Refraction.

Schlieren instrumentation was utilized to study the optical effects of heat transfer between telescope tubes and the air within the tube. A method was devised to reduce these effects. Metal tubes were set up in a schlieren system and heated by infra-red lamps to simulate the heating by sunlight which is experienced by telescope tubes under field conditions. In the laboratory setup, the air currents around the tubes could be controlled so that refractive effects of the flow of heated air could be observed in a schlieren system. The effect on seeing was studied as the tubes were heated by the infra-red lamps and as other parameters were changed. (Author)

AD-435 677 Div. 25
OTS price $5.60

General Electric Co., Syracuse, N. Y.
FEASIBILITY DEMONSTRATION OF A NEW PLASMA DIAGNOSTIC PROBE.

Final rept., 1 Dec 62-30 Dec 63,
by D. Kingsland. 27 Mar 64, 57p. Rept. no. 64A025
Contract AF19 628 2378; ARPA Order 363
AFCRL 64 254 Unclassified report

Descriptors: (*Probes (Electromagnetic), Plasma medium), (*Plasma medium, Probes (Electromagnetic)), Lasers, Ruby, Electrons, Temperature, Density, Helium, Experimental data, Plasma physics, Thyratrons, Scattering, Spectrophotometers, Theory.

The purpose of this contract was to demonstrate the feasibility of utilizing the Thomson-scattered radiation of a ruby laser to determine electron temperature and density in a helium plasma. A thyratron tube was modified to create the plasma and a spectrometer was used to observe the Doppler profile of the Thomson-scattered radiation. Langmuir-type probes built into the modified thyratron were used as an independent check on electron density and temperature. There was little correlation between the laser scattering and the check provided by the Langmuir probes. A precise determination of electron temperature was not realized using the laser scattering data. An electron density of approximately 10 to the 15th power per cubic centimeter was, however, deduced from the magnitude of the scattered energy. Opposed to this was a value, approximately 6 x 10 to the 12th power per cubic centimeter, derived from the Langmuir probe data. Theoretical effort supports the laser scattering data and negates the validity of the Langmuir probe data. From this it is inferred that this diagnostic technique is sound even though the results do not completely demonstrate feasibility. (Author)

AD-435 758 Div. 25, 2, 4
OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
INTERPRETATION OF THE MAGNETIC AND CRYSTALLOGRAPHIC PROPERTIES OF COMPOUNDS WITH THE B31 STRUCTURE,
by J. B. Goodenough. 28 Jan 64, 35p. TR345
Contract AF19 628 500
ESD TDR64 25 Unclassified report

Descriptors: (*Crystal structure, Chemical compounds), Symmetry (Crystallography), Manganese compounds, Phosphides, Arsenides, Oxides, Antimony compounds, Nuclear energy levels, Molecular properties, Vanadium compounds, Chronium compounds, Iron compounds, Cobalt compounds, Nuclear spins, Ferromagnetic materials, Magnetic properties, Transition elements.

The orthorhombic B31 structure, typified by MnP, is interpreted as a distortion of the hexagonal NiAs (B81) structure due to metal-metal bonding within the hexagonal basal planes. The number of d-like electrons per cation is known from the chemical provided the Fermi level lies in an energy gap between filled and empty bands of broad-band states, as is generally the case where there is a large electronegativity difference between cation and anion. (Author)

AD-435 808 Div. 25
OTS price $2.60

Aerospace Corp., Los Angeles, Calif.
GENERAL RESEARCH. A COMPUTER PROGRAM TO DETERMINE PLASMA DENSITY FROM EXPERIMENTAL HYDROGEN SPECTRAL LINE SHAPES,
by D. A. McPherson and H. S. Porjes. 23 Mar 64, 24p. Rept. no. ATN64 9233 8
Unclassified report

Descriptors: (*Plasma medium, Electron density), Temperature, Measurement, Hydroges, Spectra (Visual and ultraviolet), Spectrum analyzers, Experimental data, Programming (Computers), Test methods, Data processing systems, Digital computers, Line spectrum.

This IBM 7090 program fits theoretical hydrogen line shapes to experimental line shapes in order to determine plasma density. The fitting process is discussed to illustrate the limitations of the program. Resolution of the optical system is included. Data input and output are considered in detail, and a specific computation by the program is presented. No familiarity with computers is required to use this program, although the aid of a programmer would be useful to insure that the input data are in the correct format. (Author)

AD-435 825 Div. 25, 17
OTS price $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
TOTAL NORMAL AND TOTAL HEMISPHERICAL EMITTANCE OF POLISHED METALS. PART III.
Rept. for 27 Feb-19 Dec 62,
by G. L. Abbott. Dec 63, 37p.
Proj. 7360, Task 736001
WADD TR61 94, pt. 3 Unclassified report

Descriptors: (*Metals, Thermal radiation), Transition elements, Niobium, Tantalum, Tungsten, High temperature research, Heat transfer, Emissivity, Resistance (Electrical), Brightness, Spectra (Visible and ultraviolet).

The total hemispherical emittance, the total normal emittance, and the variation of electrical resistivity with temperature were measured on aged surfaces of tantalum, niobium, and tungsten in a vacuum over a temperature range from 1000 K to 3000 K. In addition, the normal spectral emittance at 0.65 micron was measured on tantalum and niobium. The total hemispherical emittance was obtained from the measured power dissipation within the uniform temperature region at the center of an electrically heated ribbon; its temperature being measured with a thermocouple or an optical pyrometer when the spectral emittance was known. The total normal emittance was determined by using a radiation thermopile. The ratio of total hemispherical to total normal emittance was also calculated directly from the angular distribution of radiation obtained by revolving the ribbon within the field of view of the thermopile. The total hemispherical emittance was found to be an average of about 20 percent higher than the total normal emittance on tantalum, niobium, and tungsten. The spectral emittance at 0.65 micron for tantalum, niobium, and tungsten is nearly identical from 1000 K to the evaporation limit. The total hemispherical emittance of molybdenum, tantalum, niobium, and tungsten may be represented to within ±5 percent of the measured value. (Author)

AD-435 839 Div. 25
OTS price $2.60

Electronics Research Lab., Univ. of California, Berkeley.
TIME-VARYING NETWORKS THE STATE VARIABLES, STABILITY AND ENERGY BOUNDS,

by E. S. Kuh. 2 Mar 64, 30p. Rept. no. 64 10
Grant AF AFOSR139 63
Unclassified report

Descriptors: (*Networks, Linear systems), Time, Stability, Energy, Circuits, Resistors, Inductance, Capacitors, Functions, Design, Spacecraft, Theory, Amplifiers, Capacitance, Analysis, Matrix algebra, Integral equations, Differential equations.

This paper is concerned with linear networks which contain time-varying resistors, inductors, and capacitors. The state variables formulation is used to describe the general circuit. The energy stored is calculated in terms of the state variables and the incidence submatrices, from which general sufficient conditions for stability are derived. Upper and lower bounding functions on the stored energy are next obtained. These functions lead to sharply defined conditions for stability and instability of periodically varying networks. Examples are included to illustrate the use of the general method and the importance of the results. (Author)

AD-435 881 Div. 25
OTS price $1.60

Electronics Research Lab., Univ. of Calif., Berkeley.
ELECTRON AND PLASMA BEAM DYNAMICS.
Final rept., 6 Mar 57-30 Sep 63,
by Charles Susskind. 31 Oct 63, 20p. Rept. no. 63 26
Contract AF19 628 324, Proj. 5634, Task 563402
AFCRL 64 95 Unclassified report

Descriptors: (*Electrons, Dynamics), (*Plasma medium, Dynamics), Vacuum, Electronics, Gases, Electro luminescence, Electron Beams, Microwaves, Electron tubes, Cathode ray tubes, Space charges, Magnetrons, Oscillation.

AD-435 886 Div. 25
OTS price $1.60

Pennsylvania Univ., Philadelphia.
FERROMAGNETIC CURIE TEMPERATURE IN CUBIC LATTICES WITH NEXT NEAREST NEIGHBOR INTERACTION,
by R. A. Tahir-Kheli and H. S. Jarrett.
Mar 64, 13p. Technical rept. no. 13
Contract Nonr55136
Unclassified report

Descriptors: (*Ferromagnetism, Green's function), Molecular properties, Magnetic properties, Magnetic moments, Nuclear spins, Antiferromagnetism, Crystal lattices, Field theory, Tables.

AD-435 903 Div. 25, 14
OTS price $3.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
FREQUENCY AND TEMPERATURE RESPONSE OF THE POLARIZATION OF BARIUM TITANATE,
by Joseph M. Ballantyne. Mar 64, 37p. TR188
Contracts AF33 616 8353, Nonr184110, Proj. NR018 801
Unclassified report

Descriptors: (*Barium compounds, Titanates), (*Titanates, Polarization), Dielectric properties, Ferroelectricity, Infrared spectroscopy, Microwave spectroscopy, Interferometers, Spectrophotometers, Frequency, Temperature, Reflection, Single crystals, Light transmission.

The frequency and temperature response of the polarization of $BaTiO_3$ from 0 to 1000 reciprocal cm and between 24 and 200 C was determined by transmission and reflectivity measurements. The infrared transmission of thin single-crystal $BaTiO_3$ was recorded from 250 to 4000 reciprocal cm; a single absorption band located at 491 reciprocal cm was observed. The reflectivity of single-domain $BaTiO_3$ was measured continuously from 10 to 4000 reciprocal cm, and at points of 0.77, 5, and 10 reciprocal cm. A drop in reflectivity occurs from 10 to 70 reciprocal cm and absorption bands are located near 175 and 470 reciprocal cm. Measurements of the dielectric constant of single-domain crystals at 0.77 reciprocal cm (24 kMc) yielded permittivities of about 1500, indicating no relaxation from the low-frequency dielectric constant. (Author)

AD-435 974 Div. 25
OTS price $2.60

Microwave Laboratory, Stanford Univ., Calif.
MICROWAVE RESEARCH.
Quarterly status rept. no. 20, 1 Nov 63-31 Jan 64.
Apr 64, 25p. Rept. no. 1148
Contract Nonr225 48, Proj. NR373 361
Unclassified report

Descriptors: (*Acoustics, Amplifiers), Microwaves, Piezoelectric crystals, Semiconductor devices electrons, Cadmium compounds, Sulfides, Energy, Velocity, Sound signals, Propagation, Elasticity, Frequency, Quartz.

AD-435 976 Div. 25, 14
OTS price $3.60

Aerospace Corp., Los Angeles, Calif.
GENERAL RESEARCH: MECHANICAL BEHAVIOR OF SAPPHIRE.
by H. Conrad. 23 Mar 64, 40p. Rept. no. ATN64 9236 14
Unclassified report

Descriptors: (*Sapphires, Mechanical properties), (*Deformation, Analysis), Tensile properties, Crystal structure, Crystal lattice defects, Shear stresses, Strain (Mechanics), Plasticity, Etched crystals, Pressure, Temperature, Photographic analysis, Symmetry (Crystallography), Fracture (Mechanics).

The present state of our knowledge on the mechanical behavior of sapphire is reviewed: Sapphire deforms plastically at temperatures above 900 C, the most common mode of deformation being slip on the basal plan in the <1120> direction. However, under certain conditions, slip may occur on prism planes or twinning may occur. A yield point is often observed. This appears to be related to the multiplication of dislocations by a mechaninism which is controlled by the motion of dislocations through the lattice, rather than by the tearing of dislocations from an impurity (or defect) atmosphere. The dynamics of yielding and flow is similar and can be expressed by either of two thermally activated equations. In one, the effect of stress is principally on the pre-exponential frequency factor; in the other, its effect is principally on the activation energy. (Author)

Division 25 - PHYSICS

AD-435 985 Div. 25, 2
OTS price $1.60

New Mexico Univ., Albuquerque, Engineering Experiment Station.
REFLECTION AND REFRACTION IN A NON-TURBULENT ATMOSPHERE WITH MOVING INTERFACES,
by Donald C. Thorn and James E. Leeman. Jan 64, 16p. Rept. no. EE101
Contract AF29 600 3445
Unclassified report

Descriptors: (*Lasers, Atmosphere), (*Velocity, Measurement), Conductivity, Reflection, Refraction, Turbulence, Atmospheric motion, Electric fields, Intensity, Radar.

AD-435 987 Div. 25
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ANISOTROPIC COEFFICIENT OF ION-ELECTRON EMISSION IN SINGLE CRYSTALS,
by Ye. S. Mashkova, V. A. Molchanov and D. D. Odintsov. 23 Mar 64, 5p.
FTD TT64 10 Unclassified report

Trans. from Doklady Akademii Nauk SSSR, 151:5, pp. 1074-1075, 1963.

Descriptors: (*Single crystals, Emissivity), (*Secondary emission, Copper), Electrons, Ions, Anisotropy, Nickel, Zinc, Measurement.

AD-436 022 Div. 25
OTS price $4.60

Stanford Electronics Lab., Stanford Univ., Calif.
COMPUTER MODEL OF A BEAM-GENERATED PLASMA,
by D. A. Dunn and I. T. Ho. Dec 63, 50p.
Rept. no. 63 138; TR0309 2
Contract AF33 657 11144, Proj. 4036, Task 403602
Unclassified report

Descriptors: (*Plasma medium, Mathematical models), (*Mathematical models, Computers), (*Electron beams, Plasma medium), Diodes, Electrons, Ions, Analysis, Equations, Frequency, Trajectories, Plasma physics, Oscillation, Density, Theory.

A one-dimensional charge sheet model of an electron beam traveling through a diode and continuously creating electron and ion charge sheets within the diode is analyzed using a computer to follow the motions of the charges during the buildup time to a quasi-equilibrium condition. A step-by-step calculation of the self-consistent field of the charges of the beam and the plasma charges created by the beam is carried out in a way that holds the total number of charge sheets constant, but increases the chaer sheet as there are more charges created. A plasma is created that has a density much greater than the beam, and large-amplitude plasma oscillations develop with density variations of both electrons and ions about an average density that has a value roughly in agreement with the prediction of static theory. These oscillations occur in two frequency ranges, with one range near the electron plasma frequency and the other near the ion plasma frequency. (Author)

AD-436 033 Div. 25
OTS price $12.50

Ordnance Research Lab., Pennsylvania, State U., University Park.
PLASTIC BUCKLING ANALYSIS OF RIB CORED CYLINDRICAL SANDWICH SHELLS SUBJECTED TO HYDROSTATIC PRESSURE,
by P. W. Hill. 24 Mar 64, 177p. Rept. no. TM619 3111 02
Contract NOw 63 0209c
Unclassified report

Descriptors: (*Structural shells, Cylindrical bodies), (*Cylindrical bodies, Structural shells), (*Buckling (Mechanics), Plasticity), (*Plasticity, Buckling (Mechanics)), (*Hydrostatic pressure, Structural shells), Configuration, Elasticity, Theory, Equations, Design, Experimental data.

AD-436 084 Div. 25, 15
OTS price $1.60

Allison Div., General Motors Corp., Indianapolis, Ind.
GENERALIZED ELECTROMAGNETIC FIELD OF THE RAIL TYPE ACCELERATOR,
by D. L. Clingman and T. L. Rosebrock. Jun 61, 15p. Rept. no. EDR2186
Contract AF49 638 864, Proj. 9752, Task 37521
AFOSR 1279 Unclassified report

Descriptors: (*Plasma medium, Electromagnetic fields), (*Electromagnetic fields, Plasma medium), Vector analysis, Integral equations, Particle accelerators.

Descriptive equations have been derived for the three-dimensional electromagnetic field of the rail type plasma accelerator, including parallel and nonparallel rail elements. Special cases treated include: (1) finite length parallel rails, three-dimensional field (2) finite length parallel rails, two-dimensional field in the plane of the rails; (3) finite length parallel rails, two-dimensional field in the plane midway between the rails and normal to the plane of the rails; (4) finite length nonparallel rails, three-dimensional field; (5) finite length nonparallel rails, two-dimensional field in the plane of the rails; (6) finite length nonparallel rails, two-dimensional field in the plane midway between the rails and normal to the plane of the rails. The assumptions of line currents and a filamentary discharge are made. (Author)

AD-436 111 Div. 25
OTS price $6.60

Courant Inst. of Mathematical Sciences, New York U., N. Y.
DIFFRACTION OF A HIGH-FREQUENCY PLANE ELECTROMAGNETIC WAVE BY A PERFECTLY CONDUCTING CIRCULAR DISC,
by D. S. Jones. July 63, 64p. Research rept. no. EM189
Contract AF19 604 5238, Proj. 5635, Task 563502
AFCRL 63 369 Unclassified report

Descriptors: (*Electromagnetic waves, Diffraction), (*Diffraction, Integral equations), High frequency, Disks, Rings, Electromagnetic fields, Scattering, Bessel functions, Series.

A method already developed for the diffraction of scalar waves by a circular disc is generalised so as to be applicable to the diffraction of an electromagnetic wave. The generalisation leads, in a straightforward manner, to an asymptotic development of the current density on the disc at high frequencies. The principal complication which arises is in solving three simultaneous linear equations for three constants which occur in the method of solution. Detailed calculations are given for a normally incident plane wave. (Author)

AD-436 128 Div. 25
OTS price $2.60

Redstone Scientific Information Center, Redstone Arsenal, Ala.
A STUDY OF THE DISTRIBUTION AND CONCENTRATION OF THERMOELASTIC STRESSES WITH THE APPLICATION OF FREEZING AND THAWING,
by N. I. Prigorovskiy and G. S. Vardanyan.
24 Mar 64, 24p.
RSIC 147 Unclassified report

Trans. from Problemy Prochnosti v Mashinostroyenii, No. 8, Akademiya Nauk SSSR, Institut Mashinovedeniya, pp. 56-68, 1962.

Descriptors: (*Thermal stresses, Photoelasticity), Test equipment, Test methods, Plastics, Models (Simulation), Rings, Disks, Freezing, Heating, Optical analysis, Plates (Structural), Cylindrical bodies, Optical properties, Interference, Refraction, Model tests, USSR, Thermodynamics.

AD-436 190 Div. 25
OTS price $1.60

Redstone Scientific Information Center, Redstone Arsenal, Ala.
STABILITY OF RODS IN THE STATE OF CREEP,
by V. F. Vorobyev. 24 Mar 64, 17p.
RSIC 145 Unclassified report

Trans. from Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki, no. 6, pp. 135-144, 1961.

Descriptors: (*Rods, Stability), (*Creep, Rods), Mathematical analysis, Differential equations, Loading (Mechanics), Stresses, Integral equations, Deformation, Equations, Theory, Mechanics, USSR.

The determination of the maximum life (critical time) of a compressively bent creep-deformed rod is being sudied. The approximate solution is sought by Halerkin's method. The author shows that with appropriate assumptions it is possible to obtain equivalent solutions using the general variational principle developed by Kachanov. The approximate numerical formulas for the determination of the critical time are derived and the result of computations is compared with the experimental data and calculations of other authors. (Author)

AD-436 197 Div. 25
OTS price $3.60

Miami Univ., Coral Gables, Fla.
DIFFUSION OF PLASMAS ACROSS A MAGNETIC FIELD.
Final rept. 1 Mar 63-28 Feb 64,
by Harry S. Robertson. 36p.
Contract AF19 628 2844, Proj. 6694, Task 669409
AFCRL 64 277 Unclassified report

Descriptors: (*Plasma medium, Diffusion), (*Magnetic fields, Diffusion), Transport properties, Cesium, Electric arcs, Convection, Stability, Confinement, Hysteres's, Theory, Electrons, Ions, Anisotropy, Dynamics, Functions.

Experimental: Experimental investigation of transport processes in cesium arc plasmas shows classical ambipolar diffusion across low magnetic fields, convective transport associated with the helical instability at intermediate fields, and a return, apparently to diffusive transport and relatively good confinement at magnetic fields ten to twenty times the critical field for the onset of the instability. Improved confinement is also achieved by using a hysteresis in the parameter space of the plasma operation, a procedure which may have wide applicability. Theoretical: The methods of Brownian motion are used to describe the diffusion of electrons and ions in a plasma across a magnetic field in the presence of an anisotropic dynamical friction. The bivariate distribution function of a plasma in a magnetic field and the partial differential equation which it satisfies are found and the distribution function is used to calculate the diffusion coefficients. (Author)

AD-436 200 Div. 25
OTS price $1.60

Redstone Scientific Information Center, Redstone Arsenal, Ala.
TEMPERATURE DISTRIBUTION IN A SYSTEM OF SOLID BODIES IN CONTACT VIA A THIN INTERMEDIATE LAYER,
by Ya. S. Podstrigach. 24 Mar 64, 8p.
RSIC 148 Unclassified report

Trans. from Inzhenerno-Fizicheskii Zhurnal, 6:10, pp. 129-136 1963.

Descriptors: (*Thermal conductivity, Mathematical analysis), (*Solids, Thermal conductivity), Temperature, Distribution, Theory, Partial differential equations, Integral equations, Solid state physics, Surfaces, U.S.S.R.

A new approach is presented for calculations on thermal contact between solids. Solutions are given for the one-dimensional transient transfer between two plates and for the two-dimensional case of a space with a cylindrical inclusion subject to a specified steady uniform flux at infinity. (Author)

AD-436 264 Div. 25
OTS price $2.60

Polytechnic Inst. of Brooklyn, N. Y.
CREEP ANALYSIS OF CIRCULAR CYLINDRICAL SHELLS,
by F. A. Cozzarelli, Sharad A. Patel and B. Venkatraman. Apr 64, 21p. Rept. no. PIBAL 685
Contract Nonr839 23, Proj. NR064 433
Unclassified report.

Descriptors: (*Creep, Analysis), (*Structural shells, Cylindrical bodies), Stresses, Iterative methods, Nonlinear systems, Sheets, Sandwich construction, Moments, Curve fitting, Differential equations, Pressure, Deflection, Theory, Load distribution.

Governing equations for nonlinear creep analysis of thin circular cylindrical shells are derived based upon a power law for creep. These equations are solved for a clamped shell subjected to uniform internal pressure. The method of solution is one of iteration where the starting solution is that for the linear case. Stress resultants and deflections are presented for various values of the parameters involved. (Author)

AD-436 274 Div. 25
OTS price $8.60

Coordinated Science Lab., Univ. of Illinois, Urbana.
LECTURES ON MAGNETOHYDRODYNAMICS,

by V. C. A. Ferraro. Mar 64, 91p. Rept. R197
Contract DA36 039AMC02208E, DA Proj.
3A 99 25 004
Unclassified report

Descriptors: (*Magnetohydrodynamics, Scientific research), Equations, Mechanics, Transport properties, Reynolds number, Electromagnetic fileds, Rotation, Magnetic fields, Energy, Motion, Pressure, Configuration.

AD-436 276 Div. 25
OTS price $7.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
(No title).
Progress rept. no. 34,
Jan 64, 77p.
Contracts Nonr1841 10 and Nonr1841 88, Projs. NR018 801 and NR015 505
Unclassified report

Descriptors: (*Materials, Solid state physics), (*Solid state physics, Materials), (*Scientific research, Materials), Dielectrics, Crystals, Single crystals, Crystal growth, Crystal lattices, Magnetism, Mass spectroscopy, Instrumentation, Semiconductors, Photoelectric materials, Tunneling, Electrical conductance, Electric insulation, Thermal conductivity, Thermal insulation.

Contents: Crystal Physics; Magnetics; Magnetic Spectroscopy; Structure Analysis; Thin-Film Solid-State Studies; Mass Spectroscopy; Magnon-Phonon Spectroscopy: Dielectrics Research.

AD-436 313 Div. 25
OTS price $4.60

Princeton U., N. J.
ANALYTICAL-EXPERIMENTAL CORRELATION OF RADIATION LOSS FROM AN ARGON ARCJET.
Technical rept.,
by Martin P. Sherman. Jul 63, 43p. Rept. no. AEL658
Contract AF33 657 9962
Unclassified report

Descriptors: (*Electric arcs, Jets), (*Jets, Electric arcs), (*Argon, Electric arcs), Bremsstrahlung, Analysis, Collimators, Power, Temperature, Correlation techniques, Gases, Nozzle gass flow, Nozzles, Theory, Experimental, Data.

A previous report described a series of total radiation surveys of a turbulent argon arcjet using a collimated radiation probe. The results, although based on admittedly rough experiments, indicated a total radiation loss considerably less than prior theoretical predictions. In the present report, these theories are reviewed in some detail, and the entire series of experiments is re-examined, particularly with reference to the effect of collimation on the results. It was found that although the radiation distributions measured in the previous report were accurate, the method used to analyze the data was incorrect. Using the same experimental data, the measured radiation loss was recalculated properly, taking into account the effect of the collimator. Results indicated a considerably larger loss than had been reported in the previous report, and were found to agree quite well with the theoretical estimates given in the present report. (Author)

AD-436 346 Div. 25
OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
MAGNETICALLY CONTROLLED GAS DUPLEXER.
Quarterly progress rept. no. 3, 27 Aug-27 Nov 63.
by Charles Ward. Mar 64, 29p.
Contract AF30 602 2960, Proj. 5573, Task 557301
RADC TDR64 73 Unclassified report

Descriptors: (*AS DISCHARGES, Microwave equipment), Measurement, Helium group gases, Magnetic pinch, Magnetic fields, Cyclotron resonance phenomena, Propagation, Waveguides, S-band, Radar duplexers, Plasma medium, Electron density, Electric arcs.

Measurements of discharge arc loss and leakage loss at S-band in a transverse magnetic field are discussed for the noble gases: helium, neon, argon and for the Penning mixture 1% argon - 99% neon. The range of pressures investigated extends from 72 microns to about 25 millimeters. Further analysis of magnetic field recovery time theory has shown that in the low pressure limit, resonant peaks in the afterglow can be used to indicate electron density. (Author)

AD-436 350 Div. 25, 9, 17
OTS price $2.60

Research and Technology Div., Air Force Systems Command, Washington, D. C.
CONDENSATION HEAT TRANSFER. PART III. THEORY OF LIQUID METAL CONDENSATION.
Rept. for Apr-Nov 63,
by Jon Lee. Mar 64, 27p.
Proj. 7340, Task 734008
ASD TDR62 1048, pt. 3 Unclassified report

Report on Nonmetallic and Composite Materials.

Descriptors: (*Liquid metals, Condensation), (*Condensation, Heat transfer), Theory, Models (Simulations), Differential equations, Turbulence, Velocity, Temperature, Integration, Numerical analysis, Transformations (Mathematics), Numerical methods and procedures, Partial differential equations, Difference equations.

Turbulent film condensation for liquid metals was investigated using both Nusselt's model and the two-phase model. The effect of turbulent transport was expressed by the eddy kinematic viscosities of Deissler and von Karman. The predictions of the average heat transfer coefficient are higher than the liquid metal data of Misra and Bonilla. However, under the premise that there is an upward vapor flow, it is shown qualitatively that an upward vapor flow can greatly reduce the heat transfer coefficient. The observed scatter of data may be attributable to the variations of vapor velocity. (Author)

AD-436 387 Div. 25
OTS price $2.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
INFRARED OPTICAL MATERIALS WITH TRANSMISSION IN THE 8-14MU AND 1-10 mm REGIONS.
Quarterly rept. no. 7, 1 Dec 63-1 Mar 64,
by A. Smakula, A. Linz, D. Gabbe, Ing. J. Kalnajs and K. Schwidtal. 1 Mar 64, 23p.
Contract Nonr184188
Unclassified report

Descriptors: (*Infrared optical materials, Dielectrics), Alkaline earth compounds, Fluorides, Lead compounds, Halides, Bromine

compounds, Measurements, Calcium compounds, Impurities, Crystal growth, Sodium compounds, Chlorides, Dielectric properties.

AD-436 417 Div. 25
OTS price $1.10

Faraday Translations, New York.
INFRARED SPECTRA OF STEARIC ACID AT VARIOUS TEMPERATURES,
by M. R. Yagudayev. 1964, 4p.
AERDL T1724 Unclassified report

Trans. from Physical Problems of Spectroscopy, Academy of Sciences USSR, Material of the 13th Conference, Leningrad, 1, 1960.

Descriptors: (*Stearic acids, Infrared spectroscopy), (*Infrared spectroscopy, Stearic acids), Temperature, Crystals, Low temperature research, Spectrophotometers, USSR, Thermostats, Brass, Liquids, Thermocouples, Polarization, Intensity, Vibration, Experimental, Data.

AD-436 420 Div. 25, 8, 30
OTS price $1.10

Faraday Translations, New York.
METHOD OF INVESTIGATING THE MICROSTRUCTURE OF PHOTOCATHODES WITH THE AID OF AN ELECTRON MICROSCOPE,
by A. I. Frimer and I. G. Sinitskaya. 1964, 4p.
AERDL T1722 Unclassified report

Trans. for doklady Akademii Nauk SSSR (Proceedings of the AS USSR), Physics Series, 66:1, pp. 49-51, 1949.

Descriptors: (*Photocathodes, Electron microscopy), (*Electron microscopy, Photocathodes), Microstructure, Surfaces, Simulation, Films, Quartz, Glass, Electron microscopes, Surface properties.

AD-436 423 Div. 25
OTS price $1.10

Faraday Translations, New York.
FATIGUE OF THIN-FILM CATHODES,
by N. S. Khlebnikov. 1964, 6p.
AERDL T420, Suppl. d Unclassified report

Trans. from Zhurnal Tekhnickeskoy Fiziki, V 16:7, pp. 766-769, 1956.

Descriptors: (*Cathodes, Thin films (Storage devices)), (*Thin films (Storage devices, Cathodes), Fatigue (Mechanics), Cesium, Oxygen, Silver, Temperature, USSR, Sensitivity, Intensity, Illumination, Infrared radiation, Antimony, Photoelectric effect.

AD-436 424 Div. 25
OTS price $1.10

Faraday Translations, New York.
ENERGY BAND PICTURE FOR Cs-O-Ag CATHODES,
by N. S. Khlebnikov. 1964, 5p.
AERDL T420, suppl. C Unclassified report

Trans. from Zhurnal Tekhnickeskoy Fiziki, V. 16:7, pp. 759-762, 1956.

Descriptors: (*Cathodes, Energy), (*Cesium, Cathodes), (*Silver, Cathodes), Oxygen, Emissivity, Antimony, Measurement, Thermionic emission, Work functions, USSR, Spectroscopy, Absorption, Photocathodes, Adsorption, Experimental data, Semiconductors.

AD-436 425 Div. 25
OTS price $1.10

Faraday Translations, New York.
MECHANISM OF ACTION OF THIN-FILM CATHODES,
by N. S. Khelebnikov. 1964, 7p.
AERDL T420, Suppl. b Unclassified report

Trans. from Zhurnal Tekhnickeskoy Fiziki, 16:7, pp. 753-757, 1956.

Descriptors: (*Cathodes, Films), Metals, Thermionic emission, Work functions, Semiconductors, Metal films, Cesium, Oxygen, Silver, Photoelectric effect, Measurement, Photocathodes.

AD-436 426 Div. 25, 8
OTS price $1.10

Army Engineer Research and Development Labs., Fort Belvoir, Va.
CONTRADICTIONS BETWEEN THE DE-BOER SCHEME AND THE FACTS CONCERNING THE REGION Cs-O-Ag AND SIMILAR CATHODES,
by N. S. Khlebnikov. 1964, 3p.
AERDL T420, Suppl. a Unclassified report

Trans. from Zhurnal Tekhnickeskoy Fiziki, 16:7, pp. 749-750, 1956.

Descriptors: (*Semiconducting films, Cathodes), (*Cathodes, Semiconducting films), Cesium, Oxygen, Silver, Secondary emission.

AD-436 458 Div. 25, 2
OTS price $9.10

School of Engineering, Princeton Univ., N. J.
MECHANICAL PROPERTIES OF GRANULAR SYSTEMS,
by Omar T. Farouki and Hans F. Winterkorn.
1 Jan 64, 101p. Rept. no. SR1; RS1
Contract AF19 628 2414, Proj. 7628, Task 762804
AFCRL 64 79 Unclassified report

Presented at the 43rd Annual Meeting of the Highway Research Board, National Research Council, 13-17 Jan 64, Washington, D. C.

Descriptors: (*Soils, Mechanical properties), (*Soil mechanics, Gravel), Sand, Spheres, Particles, Friction, Shear stresses, Theory, Particle size, Porosity.

The granular systems treated are devoid of interparticle cohesion, and the individual grains are independent of each other except for frictional interaction and geometric constraints incidental to the existing type of packing. The component particles may be of any size from the finest snad to pebbles, cobbles or even boulders. Existing theoretical concepts are briefly presented, critically reviewed and checked against a large number of available test data. Special

attention is given to the ''macromeritic state'' concept which has been developed in analogy with accepted theories concerning the solid, liquid and solution states of molecular assemblies. (Author)

AD-436 464 Div. 25
OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
IONIZATION PROCESSES IN HYDROGEN.
Preliminary rept., Feb-Mar 64,
by R. D. Hill. Mar 64, 11p.
Contract Nonr272800, Proj. 2692 4
Unclassified report

Descriptors: (*Hydrogen, Ionization), Gas ionization, Electron density, Diatomic molecules, Excitation, Plasma physics, Conductivity.

AD-436 468 Div. 25, 12
OTS price $3.60

Columbia Univ., New York.
WAVE PROPAGATION IN A THIN CYLINDRICAL SHELL,
by William R. Spillers. Dec 63, 31p. Rept. nos. TR21; CU21 63
Contract Nonr26678, Proj. NR064 446
Unclassified report

Descriptors: (*Structural shells, Shear stresses). (*Cylindrical bodies, Loading (Mechanics)). Mathematical analysis, Elastic shells, Elasticity, Viscoelasticity, Numerical methods and procedures, Wave transmission.

A solution is presented for a semi-infinite cylindrical (Timoshenko type) shell subjected to dynamic loading at one end using the method of characteristics. Explicit results are obtained for the propagation of discontinuities. These results are combined with a simple numerical procedure to obtain the solution in all regions. Numerical examples are given for an elastic and a viscoelastic material and comparisons are made to previous results concerning wave propagation in shells. (Author)

AD-436 582 Div. 25
OTS price $9.10

Carlyle Barton Lab., Johns Hopkins Univ., Baltimore, Md.
SURVEY OF THE ELECTRONIC STRUCTURE AND SPECTRAL BEHAVIOR OF THE URANYL ION,
by J. B. Newman. Apr 64, 104p. TR WR AF4
Contract AF33 615 1051
Unclassified report

Descriptors: (*Uranyl radicals, Electrons), (*Ions, Uranyl radicals), (*Electrons, Structure), (*Spectroscopy, Uranyl radicals), Molecules, Orbital trajectories, Models (Simulations), Theory, Configuration, Energy, Field theory, Paramagnetic materials.

The two main considerations of this report are to provide a coherent view of what is known about the uranyl ion, and to discern, if possible, the course of a fresh attack on the problem of its structure. The assumption is made that in order to interpret the uranyl spectra, the electronic structure and behavior in the fixed nuclear framework must first be known. Ways of finding this structure are presented, leading to the conclusion that, given the chemical evidence for strong covalent uranyl bonds, a molecular orbital treatment is required. By using a core approximation a one-configuration trial solution is set up in terms of fixed configurations on immobile cores and an antisymmetrized product of molecular orbital basis functions for the valence electrons. The practicability of a machine solution of the molecular orbital problem is being studied further. (Author)

AD-436 639 Div. 25, 5
OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
INFORMATION CAPACITY AND QUANTUM EFFECTS IN PROPAGATION CIRCUITS,
by T. Hagfors. 24 Jan 64, 41p. TR344
Contract AF19 628 500
ESD TDR64 23 Unclassified report

Descriptors: (*Communication theory, Quantrum mechanics), Hamiltonian, Propagation, Electromagnetic waves, Circuits, Signal generators, Equations, Transmitter receivers, Optmization, Mathematical models, Communication systems, Probability, Noise, Matrix algebra.

Attempt is made to establish an upper bound on the information capacity of an electromagnetic wave propagation circuit between two apertures when quantum effects come into play. We first discuss the specifications of a signal, and find that we can associate approximately BT quantities with a signal of bandwidth B and duration T, and that the energy associated with these quantities must differ by at least one quantum of energy. We then consider radiative attenuation loss within the framework of quantum theory and find that the radiative attenuation introduces a random noise in the circuit which is analogous to partition tube noise. With the channel matrix determined, we discuss the problem of evaluating the channel capacity under average and peak power constraints. Due to mathematical difficulties we are only able to establish the channel capacity explicitly when the radiative losses become extreme. In this limiting case-as a by-product-we also find that the best encoding procedure is a binary on-off system. (Author)

AD-436 642 Div. 25
OTS price $2.60

Michigan Univ. Ann Arbor.
MICROWAVE PLASMA COMPONENTS STUDY,
by Andrejs Olte and E. K. Miller. Mar 64, 29p.
Contract AF30 602 2605, Proj. 5573, Task 557301
RADC TDR64 94 Unclassified report

Descriptors: (*Plasma physics, Electromagnetic waves), Gas discharges, Wave guides, Magnetic fields, Absorption, Resonance, Theory, Microwave equipment, Dielectric properties, Cathodes (Electron tubes), Phase shift, Electron accelerators, Hydrogen, Cyclotron resonance phenomena.

The development of a first order theory for the transmission characteristics of a magneto-plasma resonance isolator employing the TM11 mode in a rectangular waveguide is continued using a tensor permittivity plasma model. The results are compared with those obtained previously where an equivalent scalar permittivity was used. Effect of variation of the magnetostatic field over the plasma volume is investigated. Some previously obtained expermental data is compared with the theoretical results. Development of a hot cathode discharge for use as a plasma package is described and some preliminary measurements on electromganetic wave interaction with the discharge are given. (Author)

AD-436 684 Div. 25
OTS price $1.60

Southwest Research Inst., San Antonio, Tex.
MIXED ACIDS ANALYSIS BY NMR.
Progress rept. no.13, 1-31 Jan 64,
by William H. Storey, Jr. Jan 64, 16p.
Contract DA23 072AMC45A
Unclassified report

Descriptors: (*Nuclear magnetic resonance, Acids), (*Protons, Nuclear magnetic resonance), (*Nitrogen, Nuclear magnetic resonance), Integrals, Acids, Mixtures, Signal-to-noise ratio, Circuits, Magnetic fields, Modulation, Instrumentation, Isotopes, Intensity.

This report relates the progress that made toward completion of proton/nitrogen-14 signal intensity ratio measurements on static samples of mixed nitrating acids. Because existing instrumentation did not give the accuracy required of these measurements, this work proceeded through a series of instrument modifications designed to increase signal/noise ratio, to improve stability, and to provide for greater speed and convenience of operation. The magnetic field is now modulated with a triangular wave at a frequency of 10/sec, and the growth of the integral of the resulting 20 signals per sec is measured over a one-min. period. The circuitry implementing the technique is shown, the technique discussed, and results obtained are presented. (Author)

AD-436 703 Div. 25
OTS price $1.10

Uppsala University, Uppsala (Sweden).
REDUCTION OF FERMION OPERATORS BY LITTLE GROUP TECHNIQUE,
by I. V. V. Raghavacharyulu. 15 Dec 63, 11p.
Rept. no. SR6; Preprint no. 111
Contract AF61 052 701
ARL 64 79 Unclassified report

Descriptors: (*Fermions, Operators (Mathematics)), (*Groups (Mathematics), Operators (Mathematics), Annihalation reactions, Field theory, Quantum mechanics.

It is shown that the different representations of The Dirac operators which are used in physical applications could be obtained as representations of a group, called Dirac group, by the little group technique. Further, this approach to these operators reduces the important theorems on their matrix representations to the well known theorems on their matrix representations to the well known theorems on the representations of the groups. This analysis is further extended to the fermion annihilation and creation operators through an extended Dirac group to obtain their well known matrix representations. (Author)

AD-436 732 Div. 25, 15
OTS price $1.60

RAND Corp., Santa Monica, Calif.
THE EXISTENCE AND UNIQUENESS OF THE SOLUTION TO A PROBLEM IN INVARIANT IMBEDDING,
by T. A. Brown. Apr 64, 18p. Memo. no. RM4075PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Transport properties, Invariance), Thermal radiation, Rods, Nonlinear differential equations, Heat transfer, Transformations (Mathematics).

Invariance principles are one of the most powerful tools in the study of radiative transport and other transport processes. The question of whether the invariance principle gives rise to unique solutions in a given physical situation, however, is often hard to answer. The present Memorandum shows that the solution is in fact unique for a certain class of nonlinear problems involving particle interactions. (Author)

AD-436 764 Div. 25
OTS price $3.60

Uppsala U. (Sweden).
LINEAR STARK BROADENING BY CHARGED PARTICLES,
by Akiko Ohno. 15 Oct 63, 31p. Report no. SR4; Preprint no. 109
Contract AF61 052 701,
ARL 64 78 Unclassified report

Descriptors: (*Charged particles, Line spectrum), (*Line spectrum, Hydrogen), Plasma physics, N-body problem, Statistical analysis, Ions, Gas ionization, Hamiltonian, Quantum mechanics, Dipole moments, Statistical functions.

Many-body interactions are studied with respect to their influence on the line shape of Lyman-alpha in a plasma. (Author)

AD-436 766 Div. 25, 8, 7, 30
OTS price $5.60

Vidya Div., Itek Corp., Palo Alto, Calif.
TRANSIENT TEMPERATURE DISTRIBUTION IN ELECTRODES WITH MOVING ARCS.
Interim technical rept., 1 May 61-28 June 63,
by D. C. Briggs. Feb 64, 53p.
Contract AF33 616 8338, Proj. 7063, Task 7063 03
ARL 64 32 Unclassified report

Descriptors: (*Electric arcs, Heat transfer), Motion, Heaters, Theory, Differential equations, Electrodes, Temperature, Copper, Silver, Tungsten, Programming (Computers), Punched cards, High temperature research.

An analysis is made of the transient heat transfer process resulting from the passage of a moving electric arc over an electrode. The analysis follows Rosenthal's initial efforts on moving heat sources. The general equation was expressed in a finite-difference form and the results were obtained by utilizing a digital computing machine program. A description and listing of the program is included. In addition, an approximate analysis using an electrical analogy was made and a rudimentary dimensional analysis correlation is presented. The results of these latter two analyses are expected to be useful for electrode temperature predictions. The results of the analyses indicate that, for the typical operating conditions considered, use of relatively thin copper electrodes result in minimum electrode surface temperatures. (Author)

AD-436 773 Div. 25
OTS price $3.60

Pittsburgh Univ., Pa.
RECOMBINATION OF MOLECULAR POSITIVE IONS WITH ELECTRONS,
by M. A. Biondi, T. R. Connor, C. S. Weller and W. H. Kasner. Apr 64, 32p. Rept. no. TR3; APR TR5
Contract Nonr624 13, Proj. NR012 114
Unclassified report

In cooperation with Westinghouse Research Labs., Pittsburgh, Pa.

Descriptors: (*Ions, Recombination reactions), (*Electrons, Dissociation), Plasma medium, Electron capture, Measurement, Electron density, Excitation, Decay schemes, Optics, Microwave spectroscopy, Interferometers, Mass spectroscopy, Theory.

Results of studies of the recombination of electrons with molecular positive ions are presented. Theoretical arguments indicate that the dissociative process - in which a molecular ion captures an electron without change of energy, forming an unstable excited molecule which then dissociates - provides a highly efficient recombination mechanism. The nature of the process responsible for the large recombination rates observed in laboratory afterglow studies is investigated using combined microwave, optical spectrometric and interferometric, and mass spectrographic techniques. Dissociative recombination is shown to be the process operative in the laboratory studies, since it is found that (a) molecular positive ions must be present to observe a large recombination rate, (b) when diatomic ions are present, excited atoms are formed in the recombination process, and (c) these excited atoms have kinetic energy of dissociation substantially in excess of thermal energy. (Author)

AD-436 792 Div. 25
OTS price $1.10

Brown Univ., Providence, R. I.
(No title).
Final rept.,
by R. W. Morse. 1963, 7p.
Contract AF49 638 6
Unclassified report

Descriptors: (*Superconductivity, Ultrasonic radiation), (*Cryogenics, Superconductivity), Liquedied gases, Helium, Ultrasonic properties, Wave transmission, Attenuation, Conductivity, Electrons, Magnetic fields, Nuclear spins, Indium, Tin, Copper, Gold, Silver, Brillouin zone, Cyclotron resonance phenomena, Aluminum, Lithium, Sodium, Potassium, Single crystals, Magnetic properties.

The temperature dependence of ultrasonic attenuation in the superconducting state, and its relationship to theories of superconductivity. Magnetic field measurements of attenuation, and attempts to determine Fermi surface shapes from the oscillatory effects. (Author)

AD-436 802 Div. 25
OTS price $2.60

RCA Labs., Div. Radio Corp. of America, Princeton, N. J.
INVESTIGATIONS OF FUNDAMENTAL LIMITATIONS DETERMINING THE ULTIMATE SIZE OF MICROSTRUCTURES.
Final rept., 1 June 61-31 Dec 63,
by R. J. Evans, A. G. Revesz and J. T. Wallmark.
31 Jan 64, 24p.
Contract AF19 604 8040, Proj. 5632
AFCRL 64 136 Unclassified report

Descriptors: (*Microstructure, Microminiaturization (Electronics)), (*Microminiaturization (Electronics), Microstructure), Redundant components, Silicon compounds, Theory, Chloride compounds, Crystal growth, Analysis, Semiconductors.

Investigations of the fundamental limitations of the ultimate minimum size of microelectronic circuits showed that a minimum size exists for solid-state devices that are part of such a microelectronic circuit. The evaluation of the minimum size was based on various physical failure mechanisms encountered during fabrication and use. The investigations included active semiconductor devices as well as passive components; i.e., resistors, capacitors, and inductors. It was concluded that a minimum possible device size would be of the order of 1000 cubic-microns, which is comparable to the smallest device made today. Redundancy, generally looked upon as a long-term solution to the reduction of failures in microcircuits, was studied separately and found to have relatively little influence when the minimum-size is considered. Furthermore, one technique for analyzing small structures, i.e., the law of scaling, was examined with regard to semiconductor devices. (Author)

AD-436 804 Div. 25, 17
OTS price $3.60

IIT Research Inst., Chicago, Ill.
YIELDING IN POLYCRYSTALLINE METALS,
by William Rostoker. June 63, 36p.
Contract AF33 657 7650, Proj. 7024, Task 7024 02
ARL 63 245 Unclassified report

Descriptors: (*Metallic crystals, Strain (Mechanics)), (*Nickel, Stresses), (*Iron, Stresses), (*Iron alloys, Silicon alloys), Deformation, Grain structures (Metallurgy), Extensometers, Particle size.

Stress-microstrain studies of Ni, Fe, and Fe-3% Si have been conducted on materials with various grain sizes. The microyield stress (1 microinch plastic strain) has been shown to depend on grain size in Ni and Fe-3% Si in the same manner as the macroyield. On the other hand, the microyield stress of Fe seems to be nearly independent of grain size. The stress-strain behavior in the microyield region is verified to follow an exponential rule. The exponent increases above 0.5 as the macroyield range is approached. The proportionality constant contains a dependence on grain size of the form of a simple power function, but the exponent is not consistent with different metals. Etch pit studies of a preliminary nature have shown that, even with the strain sensitivity attained, considerable slip has already occurred and that the true microyield stresses are below those measured. (Author)

AD-436 811 Div. 25
OTS price $10.50

Antenna Lab., Calif. Inst. of Tech., Pasadena.
THEORY OF THE SCATTERING OF ELECTROMAGNETIC WAVES BY IRREGULAR INTERFACES,
by Kenneth M. Mitzner. Jan 64, 131p. Rept. no. TR30
Contract AF49 638 1266
AFOSR 64 0802 Unclassified report

Descriptors: (*Electromagnetic waves, Scattering), (*Optics, Geometry), Theory, Green's function, Polarization, Illumination, Diffusion, Perturbation theory, Matrix algebra, Statistical analysis, Surfaces, Infrared radiation, Measurement, Integral equations, Electromagnetic fields, Transformations (Mathematics).

Two problems involving electromagnetic scattering from irregular interfaces are treated, both deterministic and statistical irregularities being

considered. First, reflection of a partially polarized plane wave from a plane interface with large irregularities is studied using geometrical optics. Matrix transformations relating incident and reflected waves are obtained for reflection from a single specular point and from an extended area containing many independent reflectors. The properties of a wave reflected from a diffusely illuminated rough interface are found, and these results are used to study reflection noise reduction when a polarization-sensitive detector viewing near the Brewster angle is used in infrared temperature measurements. Second, the method of small perturbations is used to study scattering of an arbitrary completely polarized wave from an irregular interface of general underlying shape. The irregularities are replaced by equivalent surface currents and then the field in space is found using the dyadic Green's functions of the unperturbed problem. The results obtained are valid when the irregularity has small slope and amplitude small compared to the wavelength and local radii of curvature. (Author)

AD-436 823 Div. 25
OTS price $1.10

Brown U., Div. of Applied Mathematics, Providence, R. I.
A CORRESPONDENCE PRINCIPLE FOR VISCOELASTIC WAVE PROPAGATION,
by I. Herrera and M. E. Gurtin. Feb 64, 9p.
Rept. no. TR25
Contract Nonr56225, Proj. NR064 431
Unclassified report

Descriptors: (*Wave transmission, Propagation), Solids, Field theory, Viscoelasticity, Elasticity, Linear systems, Strain, Stresses, Boundary value problems, Topology.

Proof is presented for a correspondence principle appropriate to the linearized theory of wave propagation through anisotropic and inhomogeneous viscoelastic solids. This prinicple may be stated roughly as follows: The speed of propagation of an acceleration wave through a viscoelastic solid of a given density and the relaxation tensor is identical to the speed of propagation of the same wave through an elastic solid of the same density and the elasticity tensor. (Author)

AD-436 826 Div. 25
OTS price $1.60

Brown U., Div. of Applied Mathematics, Providence, R. I.
A GENERALIZATION OF THE LAME AND SOMIGLIANA STRESS FUNCTIONS FOR THE DYNAMIC THEORY OF LINEAR VOSCOELASTIC SOLIDS,
by W. S. Edelstein and M. E. Gurtin. Apr 64, 17p.
Rept. no. TR26
Contract Nonr56225, Proj. NR064 431
Unclassified report

Descriptors: (*Solids, Stresses), (*Viscoelasticity, Stresses), (*Wave functions, Motion), Viscoelasticity, Motion, Distortion, Strain, Dynamics, Integral equations, Functions, Vector analysis, Partial differential equations.

A study is made of solutions of the displacement equations of motion appropriate to the dynamic linear theory of homogeneous isotropic, viscoelastic solids. These equations are derived from the fundamental system of field equations. In the absence of body forces, the divergence and curl of the displacement field (or the field itself, provided it is either irrotational or solenoidal) satisfy hereditary wave equations. Such an equation is simply the classical wave equation with the square of the wave velocity replaced by an integral operator of the Volterra type. It also follows that the displacement, strain, and stress fields satisfy iterated hereditary wave equations. Generalizations are introduced to viscoelasticity of the Lame and Somigliana stress function solutions of elastodynamics. By an adaptation of arguments the completeness of the generalized Lame functions is established, and, using this result, the completeness of the viscoelastic Somigliana solution is proved. Next, it is found that every displacement field can be decomposed into the sum of a solenoidal and an irrotational vector, each of which satisfies an hereditary wave equation. (Author)

AD-436 839 Div. 25
OTS price $4.60

Aeronutronic, Newport Beach, Calif.
INFRARED TRANSMISSION STUDIES. VOLUME I. SPECTRAL BAND ABSORPTANCE FOR ATMOSPHERIC SLANT PATHS,
by Gilbert N. Plass. 2 Aug 62, 42p.
Contract AF04 695 96
SSD TDR62 129, vol. 1
Unclassified report

Descriptors: (*Infrared spectroscopy, Wave transmission), Absorption spectrum, Measurement, Bessel functions, Mathematical models, Line spectrum, Equations, Gases, Temperature.

A number of equations are derived for the absorptance along a slant path. Various combinations of assumptions are made in the derivation of these equations as to the variation of the temperature and absorber concentration along the path, the extent and nature of the overlapping of the spectral lines, the variation of the intensity and half-width from line to line, the shape of the spectral lines, and the extent of the frequency interval considered. The assumptions are clearly stated for each result. A general method is developed for obtaining slant path absorptances from homogeneous path data when either the weak or strong line approximation is valid. When these equations which are valid in the weak and strong line limits are simultaneously satisfied, new general expressions are obtained for slant path absorptance which are correct in both of these limits and provide a good approximation for all values of the parameters. (Author)

AD-436 857 Div. 25, 7, 27
OTS price $2.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON NEW CONCEPTS IN ENERGY CONVERSION. Quarterly technical progress rept. no. 2, 1 Dec 63-29 Feb 64,
by W. D. Jackson, G. A. Brown, J. L. Kerrebrock and E. N. Carabateas. Mar 64, 23p.
Contract AF33 615 1083, Proj. 8173, Task 817306
Unclassified report

Descriptors: (*Energy conversion, Magnetohydrodynamics), (*Power supplies, Magnetohydrodynamics), Thermionic converters, Liquid metals, Alkali metals, Cesium, Metal films, Tungsten, Dipole moments, Space propulsion, Electric power production, Generators.

Two forms of closed-cycle magnetohydrodynamic power-generation systems and thermionic energy converters are being investigated. Current research topics for the present year are: (1) magnetohydrodynamic power generation with liquid metals, (2) liquid-metal magnetohydrodynamic generators, (3) alkali-metal magnetohydrodynamic generators, and (4) thermionic energy conversion. (Author)

AD-436 878 Div. 25
OTS price $3.60

Chalmers U. of Tech., Gothenburg (Sweden).
DYNAMIC NON-LINEAR WAVE PROPAGATION IN IONIZED MEDIA. 11. NON-LINEAR EXCITATION OF HYDROMAGNETIC WAVES AND HYBRID RESONANCES BY TWO INTERACTING HIGH POWER PRIMARY WAVES,
by K. H. B. Wilhelmsson. Jul 63, 38p. Research rept. no. 39
Contract AF61 052 451
AFCRL 63 786 Unclassified report

Descriptors: (*Electromagnetic waves, Propagation), (*Nonlinear systems, Electromagnetic waves), (*Gas ionization), Excitation, Resonance, Power, Magnetic fields, Statics, Frequency, Equations, Dynamics, Magnetohydrodynamics, Intensity, Electric fields.

The purpose of the present report is to demonstrate that two interacting strong waves which propagate perpendicular to the direction of a static magnetic field in an ionized gas can generate, as nonlinear products, difference-frequency fields, which may be hgdromagnetic waves or exhibit so-called hybrid resonances. In our investigation it is considered an infinitely extended homogeneous medium and the effect of collisions is neglected. (Author)

AD-436 885 Div. 25
OTS price $11.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE CALCULATIONS OF SPECTRAL ABSORPTION IN HEATED AIR,
by D. R. Churchill, S. A. Hagstrom and R. K. M. Landshoff. Dec 63, 153p. Rept. no. TR3 27 63 4
Contract DA49 146XZ198
DASA 1465 Unclassified report

Descriptors: (*Molecular spectroscopy, Mathematical analysis), (*Air, Molecular spectroscopy), (*Diatomic molecules, Molecular spectroscopy), Absorption spectrum, Line spectrum, Theory, Nitrogen, Nitrogen compounds, Oxides, High-temperature research, Electron transitions, Excitation, Wave functions, Quantum mechanics, Digital computers, Programming (Computers), Functions, Frequency, Band spectrum, Wave transmission, Optical phenomena.

The spectral absorption coefficient of heated air was calculated over the frequency interval and temperature range where electronic transitions in diatomic molecules are the dominant mechanism. With the aid of experimentally determined constants, the spectra of six important band systems were theoretically reconstructed. These spectra and the corresponding line intensities were preserved in the form of a magnetic tape atlas. Average absorption coefficients and their role in radiative transfer are discussed. A method of calculating group absorption coefficients based on a sampling technique is described. Digital computer programs based on this procedure were used to compute optical transmissions through heated air. Typical results of the calculation are presented. (Author)

AD-436 893 Div. 25
OTS price $8.10

Naval Ordnance Lab., White Oak, Md.
HAIR-TRIGGER OPERATION OF A NEODYMIUM LASER,
by David L. Caskey. 4 Mar 64, 74p.
NOL TR64 32 Unclassified report

Descriptors: (*Lasers, Neodymium), (*Glass, Materials), Operation, Impurities, Xenon lamps, Circuits, Electric fields, Borates, Phototubes, Sensitivity, Measurement, Energy, Calibration, Solid state physics, Electromagnetic pulses, Design, Theory.

A laser system has been devised which provides a preselected number of laser bursts at controlled intervels, by shaping the output of the optical pump light in a suitable manner. Two techniques were used. A system was constructed to demonstrate the principle. The working model provides up to three 15 microsecond laser bursts per firing, while the time between bursts is controlled by preselected delays of from 50 to 500 microseconds. The peak power output is several kilowatts. Although the model employs a 2'' x 1/4'' Neodymium-doped glass laser, the method is applicable to a wide variety of laser materials and sizes. (Author)

AD-436 897 Div. 25
OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
OBSERVATIONS ON THE BURNING OF A CANDLE AT ZERO GRAVITY,
by Arthur L. Hall. 26 Feb 64, 6p.
NAVMED MR005 13 1002; Rept. no. 5
Unclassified report

Descriptors: (*Weightlessness, Flame propagation), (*Combustion, Space flight), Controlled atmospheres.

The proposition has been advanced that normally combustible materials will not burn at zero gravity unless special conditions exist. It has been stated that certain combustibles burn better in an atmosphere of oxygen at five pounds per square inch than in an atmosphere of air at sea level pressure. By using a burning candle as the combustible, it was found that the fire did not extinguish itself during 35 zero G parabolas of 25 to 28 seconds each. The fire at 1 G or zero G burned hotter in the oxygen atmosphere than in the corresponding air atmosphere. (Author)

AD-437 115 Div. 25
OTS price $11.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
MEASUREMENTS OF STRESSES IN MACHINERY COMPONENTS,
by V. F. Yakovlev and I. S. Inyutin. 30 June 64, 148p.
FTD TT63 731 Unclassified report

Trans. from Izmereniya Napryazheniy Detaley Mashin.

Descriptors: (*Stresses, Measurement), (*Machines, Design), (*Mechanics, Textbooks), Strain (Mechanics), Strain gages, Photoelasticity, X-ray diffraction analysis, Deformation, Coatings, Optical equipment, Transducers, Test equipment, Oscilloscopes, Oscillographs, Tensiometers, USSR.

This volume considers methods for experimental measurement of stresses within machinery components. The fundamentals of stress measurement at internal points in components by means of baseless wire pickups are set forth. Examples in which a number of problems are solved experimentally under the conditions of linear, two-dimensional and three-dimensional stressed states with static and dynamic loads are given. The book is intended for use by engineering-technical and scientific workers concerned with investigation of mechanical strains and stresses. (Author)

AD-437 128 Div. 25
OTS price $1.60

AVCO-Everett Research Lab., Everett, Mass.
WAVE GROWTH AND INSTABILITY IN PARTIALLY-IONIZED GASES,
by James E. McCune. Apr 64, 19p. Rept. no. AMP 136
Contract AF04 694 414
BSD TDR64 34 Unclassified report

Descriptors: (*Gas ionization, Stability), Plasma medium, Plasma physics, Pressure, Magnetic fields, Electromagnetic waves, Thermodynamics, Gases, Electric currents, Hall effect, Damping, Frequency, Equations.

The possibility of the amplification of random or induced pressure fluctuations in slightly-ionized plasmas in the presence of a magnetic field has been discussed previously by Velikhov and others. Basically, this amplification can occur through a coupling between the waves and the background plasma due to the induced fluctuations in those plasma parameters which depend on the thermodynamic properties of the gas. In general, amplification requires the presence of a steady-state current, and some of the most interesting cases occur in the presence of a large Hall effect. In the present paper a simplified method is presented for studying a large class of wave disturbances in partially-ionized gases. Emphasis is placed first of all upon the physical description of these waves and their amplification or damping characteristics, with a view to aiding the intuitive understanding of their nature. It is found that, depending on the frequency and the initial (steady) state of the plasma as well as the orientation of the wave vector, waves can be amplified at a rate significantly greater than that indicated by Velikhov. (Author)

AD-437 129 Div. 25
OTS price $2.60

AVCO-Everett Research Lab., Everett, Mass.
SEGMENTED ELECTRODE LOSSES IN MHD GENERATORS WITH NONEQUILIBRIUM IONIZATION,
by Jack L. Kerrebrock. Apr 64, 30p. RRT178
Contract AF04 694 414
BSD TDR64 35 Unclassified report

Descriptors: (*Magnetohydrodynamics, Generators), (*Generators, Magnetohydrodynamics), Gas ionization, Electrodes, Theory, Electrical conductance, Electrons, Heating, Conductivity, Gases, Electric currents, Hall effect, Density, Temperature, Plasma physics.

A theory is proposed which accounts for the effect of Joule dissipation near a segmented electrode wall, on the electrical conductivity near the wall. In MHD generators which are designed to produce nonequilibrium ionization due to electron heating, the elevation of conductivity will occur first near the electrode wall, because the Joule heating of the fluid is much greater there than in the free stream. This local increase of conductivity will tend to cause a flow of current in the Hall direction which amplifies the dissipation, and greatly reduces the current density and elevation of electron temperature which can be attained in the generator. A theory is proposed which accounts for these phenomena in predicting generator performance as a function of the usual variables, plus the ideal electron temperature rise. The predicted maximum Hall potentials agree qualitatively with those measured by Klepeis and Rosa in a 1/2 x 3-inch generator channel. (Author)

AD-437 132 Div. 25
OTS price $1.60

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
METHOD OF DETERMINING DYNAMIC PROPERTIES OF VISCO-ELASTIC SOLIDS EMPLOYING FORCED VIBRATION,
by Tung-Ming Lee. Nov 63, 15p.
Proj. 8S66 02 001 01, Task 5028 21206
CRREL RR122 Unclassified report

Descriptors: (*Solids, Viscoelasticity), (*Viscoelasticity, Solids), (*Vibration, Solids), Dynamics, Vibration, Force (Mechanics), Frequency, Cylindrical bodies, Strain (Mechanics), Damping, Standing wave ratios, Measurement, Experimental data, Stresses.

The dynamic properties of visco-elastic solids are evaluated by using the forced longitudinal and torsional vibration techniques. A method of eliminating experimental difficulties due mainly to the coupling of sample with supporting system is introduced in using Rmax (the maximum amplitude ratio of the free end of a sample to the end attached to a driver) and fro (the corresponding vibration frequency) as a criterion. Experimental measurements of these values are sufficient to determine the dynamic properties of samples. The complex modulus is used to describe the stress-strain relationship for a visco-elastic solid. Simple expressions relating dynamic properties to Rmax and fro are obtained. In the method presented, matching of natural frequencies of the sample and the driver is not necessary and the same driving unit may be used throughout the experiment. The expressions derived for longitudinal and torsional vibrations bear direct relationship between the measured items and the dynamic properties and are simple to use. (Author)

AD-437 153 Div. 25, 20
OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
A LOW ENERGY ALKALI ATOM BEAM SOURCE,
by Donald C. Lorents and Graham Black. Feb 64, 32p. TR19
Contract SD103, SRI Proj. 3857; ARPA Order 281 62
Unclassified report

Descriptors: (*Ion beams, Alkali metal compounds), (*Lithium, Ion bombardment), Particle beams, Lithium compounds, Atmosphere entry, Space charges, Gas ionization, Instrumentation, Ion sources, Excitation.

A method of obtaining beams of alkali atoms in the eV energy range has been developed. The energy range and beam intensities make this a useful tool for studying ionizing reactions of

importance in re-entry physics. The source has been used to produce a lithium atom beam but can be used equally well with any other alkali. Lithium ions emitted thermally from a beta-eucryptite source are accelerated and focused into a ribbon beam by an electric field designed to compensate for the space charge field. Beams with current densities near the theoretical space charge limit have been attained at mean energies of 2 eV and above with a total energy spread of ±0.3 eV. The Beta-eucryptite source emits impurity ions of Na and K, but at temperatures above 1000 C the impurity ions comprise less than 0.2% of the beam. The ion beam traverses at right angles a high-density collimated thermal lithium vapor beam issuing from an oven. Neutralization of the ion beam occurs by charge transfer interactions between the ions and vapor atoms and conversion efficiencies of 10-20% are easily attained. The vapor beam is frozen out on the cooled walls of the chamber which surrounds the charge transfer region so that the fast atom beam which emerges is not contaminated by any appreciable thermal flux. (Author)

AD-437 164 Div. 25
OTS price $2.60

AVCO Everett Research Lab., Everett, Mass.
DEVIATION OF MAST OPERATION FROM ONE-DIMENSIONAL MODEL,
by F. J. Fishman and H. E. Petschek. Apr 62, 23p. RR126
Contracts AF49 638 61 and AF49 638 1129, Proj. 9751, Task 37510
Unclassified report

Descriptors: (*Shock tubes, Plasma physics), Magnetic fields, Hydrodynamics, Plasma medium, Acceleration, Wave transmission, Sheets, Shock waves, Pressure, Temperature, Rings, Cylindrical bodies, Fluid flow, One-dimensional flow, Mathematical analysis.

In the magnetic annular shock tube (MAST), the gas is pushed axially along the annual space between concentric cylinders by an azimuthal magnetic field. There is a variation in the driving pressure across the annulus, which leads to radial nonuniformities in the flow. These are analyzed for small ratios (epsilon) of the annulus spacing to the radius. The maximum value of epsilon for which the tilted current sheet does not catch up with the shock wave is calculated and it is suggested that only MASTS with epsilon's smaller than this value produce reasonably uniform flow regions. The nonuniformities which persist far behind the shock are computed; these results indicate that for low shock Mach numbers appreciable nonuniformities in pressure and temperature exist even for small values of epsilon. (Author)

AD-437 173 Div. 25
OTS price $4.60

Honeywell Research Center, Hopkins, Minn.
THERMAL-MECHANICAL HISTORY AND THE STRENGTH OF MAGNESIUM OXIDE SINGLE CRYSTALS. I. MECHANICAL TESTS,
by R. J. Stokes. Mar 64, 45p. Rept. no. HR64 258
Contract AF33 616 7465
Unclassified report

Descriptors: (*Magnesium compounds, Oxides), (*Crystal lattice defects, Single crystals), Impurities, Mechanical properties, Surfaces, Etched crystals, Chemical analysis, Heat treatment, Temperature, Fracture (Mechanics), Ductility, Diffusion.

Various dislocation impurity interactions in magnesium oxide and their effct on mechanical properties between room temperature and 1000C are discussed. (Author)

AD-437 194 Div. 25
OTS price $1.10

Rutgers Univ., New Brunswick, N. J.
RESEARCH IN SOLID STATE THEORY.
Apr 64, 10p.
Contract Nonr404 13; Grant G24277
Unclassified report

Descriptors: (*Solid state physics, Theory), Superconductivity, Thermal conductivity, Paramagnetic resonance, Magnetic properties, Alloys, Helium, Superconductors, Transition temperature, Metals, Infrared phenomena.

AD-437 212 Div. 25
OTS price $1.10

Stanford U., Calif.
THE EFFECTS OF DISLOCATIONS AND DISLOCATION ARRAYS ON SUPERCONDUCTIVITY,
by T. W. Barbee, W. A. Little and R. A. Huggins. 1964, 5p.
AEC DMS63 10 Unclassified report

Descriptors: (*Superconductors, Crystal lattice defects), Superconductivity, Tantalum, Strain (Mechanics).

AD-437 223 Div. 25, 17
OTS price $1.60

Republic Aviation Corp., Farmingdale, N. Y.
ENGINEERING PROGRESS REPORT ON INVESTIGATION OF THE BASIC MECHANISM OF METAL FATIGUE.
Quarterly rept. no. 3, 1 Jan-31 Mar 64.
22 Apr 64, 16p. Rept. no. 921 2
Contract NOw63 0704c
Unclassified report

Descriptors: (*Metallic crystals, Deformation), (*Copper, Fatigue (Mechanics)), (*Single crystals, Copper), Attenuation, Ultrasonic radiation, Stresses, Strain (Mechanics), Shear stresses, Crystal lattice defects.

Copper single crystals of orientations <100>, <110>, and <111> were deformed in tension at room temperature. The attenuation of a 10 mc longitudinal wave propagating in each crystal increased continuously during deformation. The change of attenuation decreases with increasing number of equally favored slip systems. After unloading, each of the crystals exhibited attenuation recovery. (Author)

AD-437 258 Div. 25
OTS price $10.10

Westinghouse Defense and Space Center, Baltimore, Md.
DEVELOPMENT OF A MILLIMETER WAVE MASER.
Final rept.,
10 by W. E. Hughes, C. R. Kremenek and D. C. Webb.
1 Jan 64, 129p. Rept. no. 4, 1109D
Contract DA36 029sc90778, Proj. 1G6 22001A056
Unclassified report

Descriptors: (*Masers, Millimeter waves), Anisotropy, Materials, Rutile, Impurities, Iron, Dielectrics, Ferrites, Traveling wave tubes, Waveguides, Magnets, Superconductivity, Design, Temperature.

Work that has been completed on a packaged millimeter wave maser program is presented. A dielectric cavity maser was successfully operated at a frequency of 70 gc using the iron ion, Fe(3+) in a host crystalline structure of titanium dioxide, rutile. A traveling wave maser was designed, using dielectric slowing of rutile; however, problems encountered in matching the dielectric material to the microwave circuitry prevented delivery of a completed system. A new superconducting magnet design was completed during the program, and new ferrite isolator materials were investigated to determine their behavior as a function of temperature. (Author)

AD-437 270 Div. 25
OTS price $5.60

Michigan Univ., Ann Arbor.
ENERGY ADDITION TO A FLOWING GAS BY HIGH-REPETITION-RATE, ARRESTED-BREAKDOWN DISCHARGES.
Interim technical rept.
by H. C. Early and F. J. Martin. Mar 63, 58p.
Contract AF33 616 7243, Proj. 7116, Task 7116 02
ARL 63 54 Unclassified report

Report on Energy Conversion Research.

Descriptors: (*Plasma physics, Electric discharges), (*Gas ionization, Electrical corona), Magnetohydrodynamics, Energy conversion, Electrical conductance, Gas flow, Voltage, Heating, Electrodes, Electrons, Photographs, Air, Capacitors, Pulse generators, Oscillators.

When a steep-front impulse voltage is applied to a pair of corona-type electrodes, a current of several thousand amperes will flow through the gas for a period of 10 to the minus 8 to 10 to the minus 7 seconds before spark streamer formation takes place. If the voltage is removed quickly enough and the duration of current flow is short, several joules of energy can be delivered to an atmospheric-density gas in a single suppressed-breakdown pulse. Using pulse repetition rates of several thousand per second, several kilowatts of electrical power can be delivered to a subsonic or supersonic gas stream by a single set of electrodes. Compared to arc-heating methods, the pulsed-corona discharge is diffuse and uniform and the gas flow remains much more homogeneous. The process may be useful for MHD and other research requiring a non-equilibrium gas having substantial ionization and conductivity at room temperature. (Author)

AD-437 280 Div. 25, 7, 12
OTS price $5.60

Monsanto Research Corp., Dayton, Ohio.
HIGH TEMPERATURE THERMOELECTRIC RESEARCH.
Quarterly progress rept. no. 2, 31 Dec-3 Apr 64,
by C. M. Henderson. 3 Apr 64, 43p.
Contract AF33 615 1084, Proj. 8173, Task 817302 9
Unclassified report

Descriptors: (*Thermoelectricity, Power supplies), (*Power supplies, Aerospace craft), (*Generators, Energy conversion), High-temperature research, Generators, Feasibility studies, Microstructure, Phonons, Thermocouples, Model tests, Plasma medium, Electron microscopy, Nuclear energy, Solar radiation, Design, Electric power production.

This report describes applied research to establish the technical feasibility of utilizing high temperature thermoelectric generators, as long-lived power supplies for aerospace vehicles. A nominal 50-watt laboratory generator, previously damaged by heating its intermediate junction between thermoelectric segments beyond 950 C, was repaired and subjected to renewed sustained testing at a hot-junction temperature of 1200 C in a vacuum of 10-5 - 10-6 Torr. It completed 360-hr continuous testing at 1200 C without apparent degradation of its power generating characteristics and the test is continuing. An improved experimental model generator was designed, fabricated and subjected to shakedown tests, prior to the start of sustained tests on the unit. Improved methods to permit monitoring of critical intermediate junction temperatures in multisegment thermoelements were developed and progress was made in the development of arc-plasma spray techniques for producing thermoelements and in investigations to explain the mechanisms responsible for the performances of the high temperature thermoelectric materials. (Author)

AD-437 294 Div. 25
OTS price $11.00

New York U., N. Y.
ON THE SYNTHESIS OF THRESHOLD DEVICES,
by Philip Kaszerman. Sep 63, 139p. Rept. no. TR 400 84
Grant AF AFOSR62 152 and AF AFOSR24 63
AFOSR 64 0394 Unclassified report

Doctoral thesis.

Descriptors: (*Thresholds (Physiology), Synthesis), Functions, Models (Simulations), Circuits, Analog systems, Networks, Configuration, Mapping (Transformations), Nonlinear systems, Surfaces, Tests, Equations.

A Boolean function of n variables may be defined as a mapping from the vertices of an n-dimensional hypercube to (TRUE, FALSE). A threshold function is defined as a Boolean function whose TRUE vertices are separable from the FALSE vertices by a hyperplane. It is shown that the vertices of the above hypercube lie on the surface of a hypersphere and are distributed uniformly over the surface of this hypersphere. A comparison is made between a threshold function and a continuous threshold function, i. e., the set of points on the surface of the hypersphere which lie on the TRUE side of the hyperplane. Based on this comparison, an approximate threshold device realization for any Boolean function is developed. Further, an algorithm is derived which, starting with the approximation, develops a valid realization if the function is a threshold function. (Author)

AD-437 302 Div. 25
OTS price $7.60

Naval Ordnance Lab., White Oak, Md.
IBM 7090 SUBROUTINES FOR REAL GAS PROPERTIES OF HIGH-TEMPERATURE AIR,
by W. J. Glowacki and E. F. Maher. 5 Dec 63, 72p.
NOL TR63 223; ARA211 Unclassified report

Descriptors: (*Thermodynamics, Programming (Computers)), (*Compressed air, Physical properties), Entropy, Enthalpy, Sound, Equations, Programming languages, Errors, Tables.

Empirical equations for the entropy, enthalpy, and compressibility of high-temperature and air and a sound speed equation obtained by differen-

tiating the entropy equation have been programmed as Fortran function subroutines for the IBM 7090 computer. Extensive tests have been performed to determine the accuracy of the subroutines for temperatures from 100 K to 15,000 K and for densities from 10 to the -6th power to 100 times the density at standard conditions. The calculated entropy, compressibility, and sound speed values agree with the tabulated data within 2 or 3% with few exceptions. The enthalpy values generally agree within 5%. The use of two subordinate subroutines decreases the error in the calculated entropy and enthalpy values to about 0.1% and 1% respectively. The equations and the corresponding Fortran function subroutines are presented together with the two correction subroutines, and the test results are tabulated in detail. (Author)

AD-437 316 Div. 25
OTS price $1.10

Paris Univ., (France).
LONGITUDINAL DIELECTRIC CONSTANT OF A PLASMA TAKING INTO ACCOUNT CORRELATION EFFECTS,
by J. Coste. Mar 63, 4p. TN 2
Contract AF61 052 613
ARL 63 115 Unclassified report

Descriptors: (*Plasma medium, Dielectric properties), (*Correlation techniques, Dielectric properties), Plasma physics, Kinetic theory, Equations, Electro static fields, Functions, Distributions, Transformations (Mathematics), Integration, Dielectric properties.

The longitudinal dielectric constant of a plasma, taking into account the correlation effects, is obtained from the kinetic equation of Guernsey. (Author)

AD-437 317 Div. 25
OTS price $1.60

Queen's U., Belfast (Northern Ireland).
NOTES ON PLASMA OSCILLATIONS,
by K. G. Emeleus and J. M. Jones. 10 Jun 63, 13p.
Rept. no. TN1
Grant AF EOAR62 68
ARL 63 155 Unclassified report

Descriptors: (*Plasma oscillations, Frequency), Electron beams, Excitation, Gas ionization, High frequency, Low frequency, Electrostatic fields.

The full spectrum of oscillations generated in a low-pressure, low-voltage hot-cathode plasma maintained by an electron beam is outlined. It has been confirmed that a number of frequencies occur in the plasma-electron band but the simultaneity of the oscillations in a sufficiently short time scale is questioned. Problems also arise in connection with the reality and amplitude of harmonics and subharmonics. Study of ion-band oscillations showed the need for simplification of plasma geometry. A cylindircal tube constructed with this aim has proved to be a source of intermediate band (30 - 200 Mc/s) oscillations, which are being actively investigated. Some new experiments are also being done on two-beam instability, and on plasma-electron concentration contours. (Author)

AD-437 318 Div. 25
OTS price $3.60

Technische Hochechule, Stuttgart (Germany).
INVESTIGATIONS ON NOBLE GAS FILLED THERMIONIC ENERGY CONVERTERS,
by W. Bloss. 15 Apr 63, 40p. Rept. no. TN2
Contract AF61 052 443
ARL 64 135 Unclassified report

Descriptors: (*Thermionic converters, Energy conversion), (*Helium group gases, Plasma physics), Measurement, Resistance (Electrical), Work functions, Electric fields, Theory, Instrumentation, Pressure, Electric discharges, Space charges, Electric power production.

Theoretical and experimental investigations on the application of the plasmatron mode using different noble gases at low pressures between about 0.2 and 5 mm Hg have been reported. (Author)

AD-437 339 Div. 25
OTS price $4.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
ON THE DISPERSAL OF ACOUSTIC WAVES BY RADIATIVE TRANSFER OF HEAT,
by F. K. Moore. Apr 64, 44p. Rept. no. AF1285A11
Contract Nonr265300
Unclassified report

Descriptors: (*Thermal radiation, Heat transfer), (*Gases, Dissociation), (*Acoustics, Propagation), Differential equations, Pistons, Motion, Temperature, Enthalpy, One-dimensional flow, Specific heat, Conductivity.

It is shown that the assumption of specific heat ratio near one simplifies the analysis of plane sound waves subject to energy addition dependent on temperature, and in the case of radiative energy exchange in a fairly transparent gas, a third-order differential equation is obtained. Solutions are presented for an impulsively moved piston. In a very hot gas, an optically thin wave, dispersing as though by relaxation, is embedded in an optically thick wave dispersing as though by conduction. The cool-gas case is also analyzed. It is concluded that only in a very hot gas would dispersion be observed terrestrially. (Author)

AD-437 358 Div. 25
OTS price $3.60

Lowell Technological Inst. Research Foundation, Mass.
EFFECTS OF EXTERNAL FORCES ON VIBRATING CRYSTAL PLATES.
Quarterly rept. no. 3, 1 Nov 63-31 Jan 64,
by Charles R. Mingins, Robert W. Perry and Luther C. Barcus. 31 Jan 64, 36p. Rept. no. 11
Contract DA36 039AMC02239E, Proj. 3A99 15 001
Unclassified report

Descriptors: (*Quartz, Stresses), Deformation, Tensile properties, Vibration, Symmetry (Crystallography), Compressive properties, Numerical analysis.

Research continued on the reaction of vibrating piezoids to externally applied forces and torques, with emphasis more especially on retangular plates at present. Special attention was given to tensile stresses because of the complications introduced by the bending of thin plates under lengthwise compression. Significant data appear to have been obtained bearing upon the question as to whether force or stress is the more basic parameter. Further developments are reported in

modifying the frequency equation, with a view toward making it more responsive to the utilization of information regarding the symmetry of the elements involved. (Author)

AD-437 389 Div. 25
OTS price $3.60

Maryland Univ., College Park.
DIELECTRIC CONSTANT OF A SUPERCONDUCTOR,
by Richard E. Prange. Oct 62, 37p. Rept. no. TR 266
Grant AF AFOSR62 46
AFOSR 4074 Unclassified report

Descriptors: (*Dielectric properties, Superconductors), (*Superconductors, Dielectric properties), Metals, Excitation, Polarization, Functions.

The longitudinal dielectric constant was calculated for the exted Bardeen-Cooper-Schrieffer model of a superconductor. An explicit formula is obtained which has been evaluated numerically. The competition between collective and single particle effects is pronounced, so that the dielectric function differs remarkably from the most elementary approximations to it. However, the dielectric function of the superconductor does not differ greatly from that in the normal metal in either the high frequency or static limit, regardless of the wavelength. This prevents the modifications due to superconductivity from being readily observed. In particular, the shift in the static polarizability should cause very small shifts in the phonon speed, so small that no effect on the lattice specific heat should be observed. (Auhtor)

AD-437 469 Div. 25
OTS price $1.10

Princeton Univ., N. J.
RESEARCH ON DIELECTRIC PROPERTIES AND THE STRUCTURE OF MATTER.
Quarterly status rept. no. 32, 1 Jan-31 Mar 64,
by Charles P. Smyth. 31 Mar 64, 5p.
Contract Nonr185809
Unclassified report

Descriptors: (*Polymers, Molecular properties), Ethers, Dielectric properties, Molecular structure, Molecular rotation, Solid state physics, Research program administration.

AD-437 470 Div. 25
OTS price $1.10

Oklahoma State Univ., Stillwater Research Foundation.
OPTICAL AND ELECTRICAL PROPERTIES OF STANNIC OXIDE CRYSTALS.
Technical status rept. no. 22, 1 Jan-31 Mar 64,
by E. E. Kohnke. Apr 64, 4p.
Contract Nonr2595 01
Unclassified report

Descriptors: (*Tin compounds, Crystallography), Oxides, Rutile, Crystal growth, Electrical properties, Optical properties, Photoconductivity, Research program administration, Copper compounds.

AD-437 479 Div. 25
OTS price $1.60

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
(No title).
Progress rept. no. 30.
Feb 64, 15p.
Contract Nonr186610
Unclassified report

Descriptors: (*High pressure research, Scientific research), Lead compounds, Pressure, Tin, Electrical properties, Intermetallic compounds, Crystals, Rotation, Semiconductors, Spin, Resonance, Metals, Oxides, Spectro photometers, Measurement, Absorption.

AD-437 524 Div. 25
OTS price $2.60

Miami U., Coral Gables, Fla.
DIFFUSION OF PLASMAS ACROSS A MAGNETIC FIELD,
by Harry S. Robertson. Mar 64, 27p.
Contract AF19 628 2844
Unclassified report

Descriptors: (*Plasma medium, Diffusion), (*Magnetic fields, Plasma medium), Plasma physics, Transport properties, Cesium, Electric arcs, Convection, Stability, Confinement, Confined environments, Hysteresis, Equations, Thermonuclear reactions.

Experimental investigation of transport processes in cesium arc plasmas shows classical ambipolar diffusion across low magnetic fields, convective transport associated with the helical instability at intermediate fields, and a return, apparently to diffusive transport and relatively good confinement at magnetic fields ten to twenty times the critical field for the onset of the instability. Improved confinement is also achieved by using a hysteresis in the parameter space of the plasma operation, a procedure which may have wide applicability. (Author)

AD-437 573 Div. 25
OTS price $6.60

Radio Corp., of America, Princeton, N. J.
INVESTIGATION OF TWO-CARRIER INJECTION ELECTROLUMINESCENCE,
by A. G. Fischer. 15 Mar 64, 67p. Rept. no. SR1
Contract AF19 628 3866, Proj. 4608, Task 460805
AFCRL 64 189 Unclassified report

Descriptors: (*Electroluminescence, Injection), (*Semiconductors, Electroluminescence), Voltage, Metals, Zinc alloys, Selenium alloys, Crystals, Tellurium alloys, Electrons, Motion, Mobile, Temperature, Rare earths, Ions, Tunnel diodes, Excitation, Theory.

Injection electroluminescence starting at 1.35 volts has been found in physical inversion layers of metal-semiconductor contacts to n-type ZnSe crystals. N-type ZnTe crystals have electron mobilities of 340 sq. cm./bolt/sec at room temperature. Incorporation of rare-earth ions in II-VI crystals has been accomplished. A new materials combination for tunnel-injection-EL diodes has been devised. A unified theory of recombination kinetics via centers has been written which covers the excitation, quenching, and stimulation of luninescence and their relationship with photoconductivity and optical absorption. A model of nearest-neighbor-split luninescence levels in mixed crystals is presented which accounts in a really striking way for the peculiar emission spectra of Zn(S:Se)Ag. (Author)

AD-437 596 Div. 25, 17
OTS price $2.60

Aerospace Corp., Los Angeles, Calif.
GUIDING PRINCIPLES FOR LOWERING THE DUCTILE-TO-BRITTLE TRANSITION TEMPERATURE IN THE BODY-CENTERED-CUBIC METALS,
by Hans Conrad. 10 Dec 63, 30p. Rept. no. ATN 64 9236 4
Unclassified report

Descriptors: (*Transition temperature, Metals), (*Metals, Transition temperature), Ductility, Brittleness, Shear stresses, Transition elements, Crystal lattice defects, Tungsten, Steel, Grain structures (Metallurgy), Strain (Mechanics), Molybdenum, Stresses, Iron, Deformation, High temperature research, Electron microscopy.

Yielding, flow, and fracture of body-centered-cubic (b.c.c.) metals are briefly reviewed to ascertain the guiding principles for lowering the ductile-to-brittle transition temperature, T sub c. It is concluded that the major methods for lowering T sub c in polycrystals are: (1) ultra-high purification, (2) use of scavengers to remove interstitials, (3) prestraining, (4) decreasing the grain size, and (5) introducing a dispersion of hard second-phase particles. Experimental and theoretical support exists for each of these methods. The roles of twinning and alloying have not as yet been resolved. (Author)

AD-437 598 Div. 25
OTS price $1.10

Centre National de la Recherche Scientifique, Paris (France).
THE PERTURBATION OF SPECTRAL FREQUENCIES BY SOLID MATRICES.
Quarterly technical status rept. no. 3, 1 Oct-31 Dec 63,
by B. Vodar. 31 Dec 63, 7p.
Contract DA91 591EUC2882
Unclassified report

Descriptors: (*Krypton, Line spectrum), Absorption spectrum, Xenon, Argon, Lithium compounds, Fluorides, Low temperature research.

This report contains an examination of the perturbation of spectral frequencies by solid matrices in the vacuum ultraviolet, a study of the absorption spectra of atomic species in a compressed matrix of a frozen rare gas, and a study of the possibility of studying the L sub alpha line of atomic hydrogen in solid matrices. (Author)

AD-437 608 Div. 25
OTS price $2.00

Technical Operations, Inc., Burlington, Mass.
LOSS FACTORS AFFECTING RUBY LASER SYSTEMS.
Final rept.,
by J. Masters, J. Ward and E. M. E. Murray.
31 Jan 64, 76p.
Contract AF19 628 405, Proj. 4645, Task 464502
AFCRL 64 151 Unclassified report

Descriptors: (*Lasers, Ruby), Oscillators, Propagation, Excitation, Emissivity, Oscillation, Diffraction, Mirrors, Atomic energy levels, Absorption, Measurement, Mathematical models, Temperature, Line spectrum, Lenses, Collimators, Optics.

Efficient high-power output performance of ruby lasers depends largely on reducing the effect of two basic types of loss: (1) storage losses, or losses of atoms from the excited state that occur during the pumping phase, and (2) internal propagation loss suffered by stimulated emission; both are strongly dependent on geometric parameters. Internal propagation losses were found to be significant in ruby. Storage loss due to nonlinear de-excitation during pumping is important. Preliminary measurements of the nonlinear de-excitation due to spontaneous emission amplification were performed under nonstandard operating conditions and found to be as large as 50% inversion loss for a large, cooled ruby sample. The limitations of simple physical models of ruby laser systems are discussed. Studies are reported of the important influence of mode coupling and mode selection upon the threshold condition for oscillation in ruby lasers. (Author)

AD-437 625 Div. 25
OTS price $7.60

Princeton U., N. J.
CALCULATION OF TRANSPORT PROPERTIES MIXTURES OF HELIUM AND PARTLY - IONIZED ARGON,
by Martin P. Sherman. Dec 63, 74p. AEL Rept. no. 673
Contracts Nonr1858 31; AF33 657 9962, ARPA Order 206 61
Unclassified report

Descriptors: (*Helium group gases, Transport properties), (*Plasma physics, Helium group gases), Viscosity, Thermal conductivity, Thermal diffusion, Helium, Argon, High-temperature research, Theory, Electron density, Gas ionization.

Transport properties were calculated for equilibrium mixtures of helium and partly-ionized argon as functions of temperature and helium concentration. Viscosity, thermal conductivity . diffusion, and thermal diffusion data, as well as effective diffusion and thermal diffusion coefficients, are presented for temperatures up to 15,000 K and helium concentrations from zero to 100%. The method was based on Chapman-Enskog theory, using collisional data from various sources for the different particle interactions. An alternate method based on a relaxation-time model was also used for viscosity calculations, and provided good correlation with the Chapman-Enskog results. (Author)

AD-437 631 Div. 25, 6
OTS price $2.60

Technical Research Group, Syosset, N. Y.
ON THE EFFECTS OF A NONRIGID STRIP ON THE PROPAGATION OF SOUND,
by Visvaldis Mangulis. Mar 64, 25p. Rept. no. 142TN64 1
Contract Nonr3208 00
Unclassified report

Descriptors: (*Sound transmission, Deflection), (*Acoustic impedance, Mathematical analysis), Mathematical analysis, Underwater sound, Integral equations, Green's function, Attenuation, Underwater sound signals, Refectors, Reflection, Scattering.

The related problems of the radiation of sound from a line source near an infinite nonridgid strip in an infinite rigid plane baffle and of the scattering of a plane wave by the same strip are solved when the boundary condition on the strip is: pressure = (velocity normal to the strip)(onstant acoustic impedance of the strip). Some numerical results are presented for a strip which is very wide as compared to a wavelength. (Author)

AD-437 632 Div. 25, 2
OTS price $15.00

Denver Research Inst., Colo.
RADIANCE OF THE EARTH IN SELECTED WAVELENGTH INTERVALS AS OBSERVED FROM HIGH ALTITUDES.
Final rept.,
by David G. Murcray. 31 March 64, 223p. Rept. no. 2149
Contract AF33 616 7633, Proj. 4479, Task 447901
AFCRL 64 165 Unclassified report

Descriptors: (*Earth, Infrared radiation), (*Solar radiation, Reflection), Atmosphere, Clouds, High altitude, Radiometers, Meteorological balloons, Emission, Secondary emission, Infrared filters.

This report presents the data concerning the radiance of the earth in the 2.7 mu and 4.3 mu wavelength region as observed from an altitude of 31 kms. These data were obtained on a number of balloon flights made with an automatic radiometer system. The results are compared with the results predicted on a theoretical basis. These comparisons indicate fairly good agreement with some of the theoretical results; however the maximum radiances observed in the 2.7 mu region exceed the predicted radiances by several orders of magnitude. (Author)

AD-437 636 Div. 25
OTS price $9.60

Air Force Cambridge Research Labs., Bedford, Mass.
NOTES ON HYDROMAGNETICS AND PLASMA PHYSICS,
by R. L. Caravallano and J. F. McClay. Dec 63, 112p.
Proj. 7601
AFCRL 63 907 Unclassified report

Descriptors: (*Magneto hydrodynamics, Theory), (*Plasma physics, Theory), Conductivity, Fluid flow, Plasma medium, Charged particles, Motion, Force (Mechanics), Adiabatic gas flow, Magnetic storms, Terrestrial magnetism.

AD-437 644 Div. 25
OTS price $1.10

Centre National de La Recherche Scientifique (France).
THE PERTURBATION OF SPECTRAL FREQUENCIES BY SOLID MATRICES.
Quarterly technical status rept. no. 1, 1 Apr-30 June 63,
by B. Vodar. 30 June 63, 5p.
Contract DA91 591euc2882
Unclassified report

Descriptors: (*Absorption spectrum, Helium group gases), Xenon, Argon, Krypton, France.

AD-437 649 Div. 25
OTS price $1.10

Microwave Lab., Stanford Univ., Calif.
A STUDY OF OPTICAL TRANSITION PROBABILITIES AND METHODS OF MODULATING THEM.
Semiannual progress rept. no. 3, 1 Apr-30 Sep 63. Nov 63, 5p. Rept. no. 1111
Grant DA AROD31 124G449
Unclassified report

Descriptors: (*Crystals, Optical phenomena), (*Optical phenomena, Crystals), Ions, Electric fields, Symmetry (Crystallography), Phonons, Sidebands, Magnesium compounds, Oxides, Chromium, Paramagnetic materials, Vanadium, Crystal lattices, Probability, Hamiltonian.

AD-437 652 Div. 25
OTS price $1.10

Centre National de la Recherche Scientifique, Paris (France).
THE PERTURBATION OF SPECTRAL FREQUENCIES BY SOLID MATRICES.
Quarterly technical status rept. no. 2. 1 Jul-30 Sep 63,
by B. Vodar. 30 Sep 63, 3p. Rept. no. E450P
Contract DA91 591EUC2882
Unclassified report

Descriptors: (*Spectroscopy, Krypton), (*Absorption spectrum, Analysis), Argon, Ultraviolet spectroscopy, Ultraviolet optical materials, Lithium compounds, Fluorides, Mirrors, Temperature, S-matrix, Perturbation theory.

AD-437 664 Div. 25, 14
OTS price $3.60

IIT Research Inst., Chicago, Ill.
ANALYSIS OF FRACTURE PROBABILITIES IN NON-UNIFORMLY STRESSED BRITTLE MATERIALS,
by N. A. Weil and I. M. Daniel. 5 May 64, 34p.
Contract AF33 616 7465
Unclassified report

Descriptors: (*Brittleness, Fracture (Mechanics)), (*Fracture (Mechanics), Brittleness), Ceramic materials, Stresses, Probability, Statistical analysis, Theory, Beams (Structural), Loading (Mechanics), Plastics, Tensile properties.

This paper describes the results of theoretical studies on the effect of non-uniform stress fields limited to those encountered in prismatic beams under bending, upon the fracture of brittle materials. Derivations were carried out to determine the risk of rupture of bending specimens subjected to a symmetrical four-point load of arbitrary spacing, the symmetric three-point loading and pure bending forming limiting cases of this more general loading. The analysis was based on materials obeying the Weibull distribution function with assumptions for either volumetric or surface flaw dispersion conditions. Comparisons are presented between the predicted strengths of bending and tensile specimens. (Author)

AD-437 668 Div. 25
OTS price $3.60

Army Electronics Research and Development Agencies, Fort Monmouth, N. J.
MICROWAVE RESONANCE PROPERTIES OF SINGLE-CRYSTAL FERRITES WITH UNIAXIAL ANISOTROPY,
by Maurice Weiner. Nov 63, 37p.
Task 1G6 22001A055 04
AELRDL TR2384 Unclassified report

Descriptors: (*Ferrites, Single crystals), (*Single crystals, Ferrites), (*Microwaves, Resonance), (*Resonance, Microwaves), (*Anisotropy, Ferrites), Linear systems, Theory, Direct current, Electric fields, Frequency, Propagation, Stability.

The influence of uniaxial anisotropy on several important microwave phenomena in ferrites is presented. Specifically, it is shown that the major change in the linear theory when the d-c field, H, is along the symmetrical axis, is equivalent to a shift in the static field. When H lies in an easy plane, an

intrinsic ellipticity is introduced into the precessional motion, which is reminiscent of shape anisotropy. Calculations of the critical fields due to spin-wave instability show a non-trivial result for the second-order effect when H is directed along the symmetrical axis. In addition, the more complicated results which occur when H lies in an easy plane are described. (Author)

AD-437 670 Div. 25
OTS price $6.60

Nevis Labs. Columbia Univ., Irvington-on-Hudson, N. Y.
ELECTRON DECAY BRANCHING RATIO OF THE PION,
by Alan Strelzoff. Mar 64, 63p. Rept. nos. 121 R 419, CU227
Contract Nonr26672
Unclassified report

Doctoral thesis.

Descriptors: (*Pions, Decay schemes), Leptons, Electrons, Muons, Neutrinos, Nuclear particles, Theory, Sodium compounds, Iodides, Crystals, Nuclear radiation spectrometers, Scintillation counters, Measurement, Mathematical analysis, Nuclear spectroscopy.

The ratio of the pion decay rates for the processes, pi yields e + nu and pi yields mu + nu was measured. A large NaI (tl) crystal was used to separate the high energy pion decay electrons from the continuous spectrum of the pi-mu-e chain. Counting decay electrons immediately following a pion stop, the ratio by a direct comparison of pi-e and pi-mu-e electrons was determined. From an observed 10,891 pi-e electrons a precision of 1.8% was attained in the guantity (pion lifetime x branching ratio). Considering the present uncertainty in the pion lifetime the branching ratio, (1.247 ± 0.028) x 10 to the -4 power is obtained. This is in good agreement with the theoretical value, 1.233 x 10 to the -4 power, required by the V-A theory when radiative corrections are included. (Author)

AD-437 673 Div. 25.
OTS price $3.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
EXTRACTION OF IONS FROM PLASMA ION SOURCES AND PRIMARY FORMING IONIC BUNDLES,
by M. D. Gabovich. 13 Dec 63, 34p.
FTD MT63 181 Unclassified report

Trans. from Pribory i Tekhnika Eksperimenta, No. 2, pp. 5-19, 1963.

Descriptors: (*Plasma jets, Ion sources), (*Ion beams, Magnetohydrodynamics), Focusing, Axially symmetric flow, Magnetic fields, Ions, Sampling, Boundary layer, Plasma physics.

AD-437 682 Div. 25
OTS price $8.60

Block Associates, Inc., Cambridge, Mass.
STUDIES ON MAKING WAVE MEASUREMENTS IN THE OPEN SEA.
Final rept.
by Jerome H. Milgram. 3 Mar 64, 94p.
Contract Nonr408200, Task 062 313
Unclassified report

Descriptors: (*Water waves, Measurement), (*Ocean waves, Measurement), Buoys, Signals, Power, Height finding, Motion, Model tests, Floats, Design, Theory, Instrumentation, Analysis, Voltage, Transducers.

The final goal of this work is to develop a bouy and measuring scheme which measures and transmits a single signal from which the power spectrum of the wave height can be recovered. This can be accomplished by making a buoy stable enough so that effects of its motions are negligible on the measured wave height, or the effects of the motions must be obtainable from the single measured signal. Since the single measured signal shall probably be the wave height with respect to the buoy, a precise method of making this measurement has been devised and is described. An extensive study of the motion characteristics of one type of wave measuring buoy is carried out. The significant heave forces on the buoy are analyzed. Results of full scale and model testing are described as well as the application of these results toward wave buoy design. It is suggested that a wave measuring buoy be built according to the concepts developed in this report and that the performance of such a buoy be measured. (Author)

AD-437 750 Div. 25
OTS price $3.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
ANALOG STUDIES OF UPSTREAM-INCLINED WAVES IN MAGNETO-GASDYNAMIC FLOW,
by Lawrence S. Iwan. Dec 63, 39p.
Grant AF AFOSR62 201
Unclassified report

Descriptors: (*Magnetohydrodynamics, Analog systems), (*Analog systems, Magnetohydrodynamics), (*Gas flow, Magnetohydrodynamics), Magnetic fields, Velocity, Conductivity, Elasticity, Momentum, Force (Mechanics), Differential equations, Propagation, Simulation.

An analog has been devised to study two dimensional magneto-gasdynamic flow for the case of aligned magnetic and velocity fields and a perfectly-conducting compressible fluid. The analog consists of stretched elastic sheets in an incompressible fluid. The elastic sheets are analogous to a magnetic field and produce a body force on the fluid when displaced from their equilibrium positions. The differential equations describing the system are the same as the magneto-gasdynamic equations for the case cited, except for the expression for the body force in the momentum equations. Analysis of the analog system reveals striking similarities between the small disturbance propagation characteristics of that system and magneto-gasdynamics. An experiment was performed in which a body was towed along a tank filled with water in which sheets of natural rubber had been stretched to simulate a uniform magnetic field. Upstream-inclined waves were observed, whose angles with the direction of the body's motion agreed well with the predicted values. (Author)

AD-437 753 Div. 25
OTS price $2.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
CRYSTAL STRUCTURE, SYNTHESIS, AND MAGNETIC, PROPERTIES OF CHRYSOBERYL,

by Robert E. Newnham. Nov 63, 26p. Rept. no. TR183
Contract AF33 616 8353
Unclassified report

Descriptors: (*Aluminum compounds, Oxides), (*Crystal structure, Magnetic properties), Beryllium, Synthesis, Crystal growth, Symmetry (Crystallography), Impurities, Chromium, Minerals, Least squares method, X-ray diffraction analysis.

AD-437 754 Div. 25, 8
OTS price $2.60

Boeing Co., Seattle, Wash.
CORRELATION OF PROTON TO NEUTRON AND ELECTRON TO PHOTON RADIATION DAMAGE IN TRANSISTORS AND DIODES,
by G. L. Keister. 22 Apr 63, 21p. Document no. D2 90407
Unclassified report

Descriptors: (*Transistors, Radiation damage), (*Diodes (Semi-conductor), Radiation damage), (*Protons, Radiation damage), (*Neutrons, Radiation damage), Electrons, Photons, Radiation effects, Energy, Silicon, Germanium, Semiconductor devices, Ionization.

The correlation of proton, neutron, electron, and photon radiation damage in semiconductor devices is in reality one part of a much more comprehensive concept which is being considered by many investigators in the field of radiation damage. This concept is the establishment of some means whereby a general correlation (or equivalence) of radiation damage can be established. In discussing the correlation of proton, neutron, electron, and photon radiation damage in semiconductor devices, the results of work which has been done at Boeing and selected results of other investigators in the context of this overall problem are presented and some generalized statements are made which might help ASTM members establish standards for a uniform method of handling the radiation problem. (Author)

AD-437 768 Div. 25
OTS price $7.60

Quantum Electronics Lab., Calif. Inst. of Tech., Pasadena.
AN INTERFEROMETRIC MEASUREMENT OF INDEX OF REFRACTION,
by Michael S. Shumate. 13 Mar 64, 77p. Rept. no. SR5
Contract AF19 604 8052, Proj. 4600, Task 460006
AFCRL 64 175 Unclassified report

Descriptors: (*Refractive index, Measurement), (*Interferometers, Optics), (*Solid, Optical analysis), Errors, Analysis, Temperature, Electric fields, Magnetic fields, Pressure, Gases, Prisms (Optics), Barium compounds, Titanates, Quartz, Glass, Single crystals, Optical materials, Masers, Lasers.

Of the several common methods for measurement of the index of refraction of solid optical materials, only one, the minimum deviation method, can conveniently be used for materials whose refractive index exceeds 1.8. The minimum deviation method requires that a large prism of the optical material be constructed; this is not always possible or feasible for some crystalline optical materials that are of current interest. A method for measurement of index of refraction is presented which requires a thin flat plate of the optical material and is unlimited in the range of refractive index it can cover. The method uses a two-beam interferometer to determine the optical path length through the flat plate by tipping away from normal incidence through a measured angle. It may be used in the visible portion of the spectrum directly, or extended to other spectral regions with the use of a suitable detector. (Author)

AD-437 769 Div. 25
OTS price $5.00

Space Sciences, Inc., Waltham, Mass.
EVALUATION OF EXISTING LITERATURE OF THE INTERACTION OF HIGH-DENSITY PLASMA WITH ELECTRIC, MAGNETIC AND FLUIDDYNAMIC FIELDS.
Interim technical rept.,
by W. E. Knabe. Feb 64, 383p.
Contract AF33 657 8761, Proj. 7063, Task 7063 01
ARL 64 34 Unclassified report

Report on Mechanics of Flight.

Descriptors: (*Plasma physics, Bibliographies), (*Bibliographies, Plasma physics), (*Electric fields, Plasma medium), (*Magnetic fields, Plasma medium), Fluid dynamic properties, Density, Electric arcs, Plasma jets, Particle accelerators, Theory, Gas flow, Electrodes, Power.

This Report contains a review of recent publications on certain aspects of the interaction of plasmas, especially at high densities, with electric, magnetic and fluid-dynamic fields. The discussions refer in particular to theoretical and experimental studies of electric arcs. The Report is subdivided into two parts: (1) dealing with the phenomenology and description of thermal arcs; (2) dealing with the phenomenology of - and existing models and analyses, as well as interpretations of the observational results, for - the interaction of arcs and magnetic fields. Principles of modern application are also discussed. (Author)

AD-437 783 Div. 25
OTS price $1.50

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A GLOW DISCHARGE PLASMA GENERATOR,
by George W. Loptien. Mar 64, 53p.
Proj. 1426, Task 142603
ASD TDR63 835 Unclassified report

Report on Experimental Simulation of Flight Mechanics.

Descriptors: (*Plasma medium, Generators), (*Generators, Plasma medium), (*Glow discharges, Plasma medium), Plasma physics, Electrical properties, Direct current, Energy, Low temperature research, Supersonic nozzles.

This investigation was to determine the capabilities and operating characteristics of a small-scale research facility using a d.c. discharge as the energy source. The goal of the program is to develop a cold plasma source suitable for use with a crossed field accelerator. The apparatus consists of a continuous low temperature electric discharge, the products of which are expanded through a supersonic nozzle into a low pressure chamber. Air has been used as the test gas. The apparatus may be operated continuously. The electricl characteristics of the discharge

have been determined from voltage, current and mass flow measurements, and brief impact pressure, current collection and stagnation temperature measurements have been made in the nozzle effluent. The use of a d.c. glow discharge type plasma generator for producing a cold plasma appears feasible. (Author)

AD-437 790 Div. 25
OTS price $2.60

Quantum Electronics Lab., Calif. Inst. of Tech., Pasadena.
PLASMA DIAGNOSIS BY MEANS OF PHOTON-ELECTRON SCATTERING,
by S. E. Schwarz. 1 Feb 64, 24p. Rept. no. SR6
Contract AF19 604 8052, Proj. 4600, Task 460006
AFCRL 64 242 Unclassified report

Descriptors: (*Plasma medium, Diagnosis), (*Photons, Scattering), (*Electrons, Scattering), Gas discharges, Helium, Impurities, Glow discharges, Recombination reactions, Lasers, Spectroscopy, Luminescence, Hydrocarbons, Gases, Reflection, Plasma physics.

A brief summary of photon-electron scattering experiments is presented, and comments made regarding their application to plasma diagnostics. The general field of gas discharge afterglow studies is reviewed, and a summary of recent experimental studies of helium afterglow is presented. A photon-electron scattering apparatus was used to perform experiments indicating the feasibility of afterglow studies using the Thomson scattering method. An impure helium discharge afterglow having properties which make it difficult to diagnose by other means was studied using laser scattering. The afterglow was also examined spectroscopically, and the results are compared. Unexpected phenomena which have been called induced luminosity and giant scattering were observed. The former is superficially like the radiation enhancement reported by Rose, Lidsky, and Thompson, but there are substantial differences. The observed effects appear to arise from hydrocarbon impurities in the gas. (Author)

AD-437 795 Div. 25
OTS price $6.60

Quantum Electronics Lab., Calif. Inst. of Tech., Pasadena.
AN ANALYSIS OF MULTIREFLECTOR OPTICAL RESONATORS,
by Peter O. Clark. 27 Feb 64, 61p. SR4
Contract AF19 604 8052, Proj. 4600, Task 460006
AFCRL 64 161 Unclassified report

Descriptors: (*Resonators, Reflectors), (*Reflectors, Resonators), Lasers, Optical phenomena, Geometry, Optics, Mirrors, Lenses, Stability, Difference equations, Analysis, Electric fields, Integral equations, Propagation.

Geometrical optics and self-consistent field techniques are used to determine the properties of multireflector optical resonators in which the field distributions are multiply-reflected and travel in clockwise and counter-clockwise directions in the cavity. Two types of resonators are considered, symmetric N-mirror resonator whose axis is a regular N-sided polygon and a nonsymmetric four-mirror resonator whose axis is a parallelogram. The geometrical optics approach leads to sets of coupled nonlinear difference equations which describe the paths of optical rays in the resonators. Approximate solutions to the equations are obtained and a calculation of the first correction term is carried out in the case of the symmetric cavity. The approximate analysis also may be formulated in a chain matrix representation. Stability conditions are obtained. The set of difference equations may be reduced to recurrence relations which enable the path of an optical ray in the cavity to be calculated exactly using a digital computer. (Author)

AD-437 797 Div. 25
OTS price $4.60

RAND Corp., Santa Monica, Calif.
PLASMA CONDUCTIVITY AT LOW FREQUENCIES AND WAVE NUMBERS,
by M. G. Kivelson and D. F. DuBois. Apr 64, 45p.
Rept. Memo RM3755PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Plasma medium, Conductivity), (*Conductivity, Low frequency), Plasma physics, Theory, Electromagnetic properties, Ions, Viscosity, High temperature research, Kinetic theory, Equations, Thermal conductivity.

The low frequency electromagnetic conductivity of high temperature low density plasmas is examined starting from a linearized kinetic equation of the Balescu type. The conductivity is related in a well-known way to the properties of collective waves, and expressions are obtained for the phase velocity and damping of these waves. The results agree with experiment to just within experimental accuracy. (Author)

AD-437 803 Div. 25
OTS price $1.25

Air Force Aero-Propulsion Lab., Air Force Systems Command, Wright-Patterson AFB, Ohio.
LOW-GRAVITY POOL-BOILING HEAT TRANSFER.
Rept. for Feb 63-Jan 64,
by Robert Glen Clodfelter. Mar 64, 46p.
Proj. 3141, Task 314105
APL TDR64 19 Unclassified report

Report on Electric Propulsion Technology.

Descriptors: (*Boiling, Drop testing), (*Space environmental conditions, Boiling), Gravity, Free fall models, Heat transfer, Acceleration, Film boiling, Nucleate boiling, Bubbles, Models (Simulation).

The results are presented of an investigatio: into the characteristics of pool boiling at reduced gravity. Experimental data taken in a 1.8-second drop tower, using water as the test fluid, are given for a 0.020-inch diameter platinum wire and 1/8-inch and 1/4-inch platinum ribbons. In the range of nucleate boiling no significant influence of gravity or geometry was observed whereas the critical heat flux was affected by both gravity and the geometry of the container as well as by the time at reduced gravity. (Author)

AD-437 808 Div. 25
OTS price $2.60

Boeing Scientific Research Lab., Seattle, Wash.
ON THE STABILITY OF MHD CHANNEL FLOW,
by F. D. Hains. Mar 64, 28p. FSL Rept. no. 88, D1 82 0331
Unclassified report

Also available from the author.

Descriptors: (*Magnetohydrodynamics, Fluid flow), (*Fluid flow, Stability), Equations,

Magnetic fields, Reynolds number, Perturbation theory, Conductivity, Viscosity, Incompressible flow, Heating, Heat transfer, Velocity, Functions, Theory.

The stability equations are derived for MHD channel flow with aligned magnetic field. The equations are simplified in three limiting cases: (1) the interaction parameter N is very small, (2) the magnetic Reynolds number is very large, and (3) the magnetic Reynolds number is very small. (Author)

AD-437 820 Div. 25
OTS price $4.60

Kiruna Geophysical Observatory (Sweden).
AN INVESTIGATION OF THE NATURAL ELECTROMAGNETIC RADIATIONS BETWEEN 10c/s AND 10 kc/s,
by Alv Egeland, Georg Gustafsson, Sven Olsen and William Barron. 20 Feb 64, 42p. SR5
Contract AF61 052 678
AFCRL 64 304 Unclassified report

Descriptors: (*Electromagnetic waves, Extremely low frequency), Very low frequency, Seasonal variations, Diurnal variations, Data, Propagation, Curve fitting, Calibration, Noise, Atmospherics, Graphics, Sweden, Massachusetts.

Naturally occurring electromagnetic radiation in the audio-frequency range has been studied at Kiruna Geophysical Observatory (geomagnetic latitude 65.3N) since 1958. The results obtained are to some extent compared with similar measurements at Sagamore Hill, Mass., USA (geomagnetic latitude 54N) carried out during the same period. Several emission bands, which are quite distinct from the normal background-signals and are obtained as strong enhancements in portions of the spectrum, have been recorded. (Author)

AD-437 864 Div. 25, 5
OTS price $4.60

American Optical Co., Southbridge, Mass.
EXPERIMENTAL VERIFICATION OF SUN POWERED LASER TRANSMITTER.
Interim engineering rept. no. 2, Aug-Nov 62,
by D. A. LaMarre, G. R. Smpson and M. R. Thorburn. Nov 62, 41p.
Contract AF33 657 8619, Proj. 4335, Task 433513
Unclassified report

Descriptors: (*Lasers, Light communication systems), (*Light communication systems, Lasers), Transmitter receivers, Sun, Power, Solar radiation, Optical instruments, Calcium compounds, Tungstates, Impregnation, Neodymium, Glass, Silver, Indium, Heat exchangers, Thermal conductivity, Heat sinks.

This report published describes the continuing effort of experimentation and design leading to the delivery of an experimental model of a sun-powered laser transmitter. The design and fabrication of the transmitter is discussed with respect to the optical system and mount. An experimental Nd-doped CaWo4 Laser is described. Related to this description are integral pump optics requirements, fabrication problems and thermal considerations of the unit. Experimental Nd-doped glass lasers are discussed in both the short- and long-fiber configurations. (Author)

AD-437 865 Div. 25, 5
OTS price $4.60

American Optical Co., Southbridge, Mass.
EXPERIMENTAL VERIFICATION OF SUN-POWERED LASER TRANSMITTER.
Interim engineering rept. no. 1,
by D. A. LaMarre. July 62, 43p.
Contract AF33 657 8619, Proj. 4335, Task 433513
Unclassified report

Descriptors: (*Lasers, Light communication systems), (*Light communication systems, Lasers), Transmitter receivers, Sun, Power, Solar radiation, Ruby, Calcium compounds, Tungstates, Neodymium, Impregnation, Impurities, Glass, Cryogenics, Atomic energy levels, Excitation.

The feasibility of using four-level laser materials is investigated. A general expression is derived for the figure of merit ''G'' of a four-level laser in the sun-powered end-pumed configuration. (''G'' relates the laser parameters to the power input needed for threshold lasering). In a survey of possible new laser materials, two four-level types, neodymium-doped calcium tungstate and neodymium-doped glass, were determined to be promising. Thermal problems involved in cooling neodymium-doped glass are analyzed. Also, the status of the design and construction of the sun-tracking laser mount is specified. (Author)

AD-437 866 Div. 25
OTS price $3.60

Servomechanisms, Inc., Goleta, Calif.
THIN FILM RESEARCH.
Final rept. 15 Apr-15 Oct 63,
by Edwin J. Soxman and Gordon N. Steele.
4 Nov 63, 36p. Rept. no. 63 3
Contract Nonr416500
Unclassified report

Descriptors: (*Semiconducting films, Electroluminescence), (*Thin films (Storage devices), Preparation), Zinc compounds, Sulfides, Semiconductor devices, Tunnel diodes, Germanium compounds, Oxides, Films, Organic coatings, Polycyclic compounds, Heterocyclic compounds, Ketones, Phosphorescent materials, Evaporation, Dielectric films, Display systems, Emissivity.

Small crossed grid arrays of electroluminescent cells having a resolution of 33 lines/in. were made by a vacuum deposition method. The phosphor was ZnS:Mn. A thick, low conductivity layer of GeO2 was included in most of the devices. Background cross-talk was negligible because of the high suppression ratio characteristic of the phosphor used. Current-voltage measurements were made for films ranging from a few hundred up to some 50,000 angstroms thick. In addition to the ac electroluminescence reported earlier, dc electroluminescence at high applied voltages was observed with either polarity of the applied voltage, both in cells with and without a supplementary film of GeO2. The emission was greater when the GeO2 film was included and when the aluminum electrode was the cathode. Although the quantitative measurements were made at room temperature, both ac and dc electroluminescence were also observed at 77 K. Tunnelling through thin organic films was investigated on an exploratory basis. The particular organic compound was fluorescein, selected for its molecular dipole and suitability for film formation by vacuum deposition. The films were deposited either under the influence or in the absence of a prepolarizing field. (Author)

Division 25 - PHYSICS

AD-437 872 Div. 25
OTS price $5.60

Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.
RESEARCH ON THE SOLAR-GEOPHYSICAL ASPECTS OF COSMIC RADIATION AND MAGNETO-HYDRODYNAMICS.
Final rept., 18 Dec 54-30 Nov 62,
by J. A. Simpson. 3 Sep 63, 51p.
Contracts AF19 604 4554; AF19 604 1288, Proj. 8600, Task 86001
AFCRL 63 893 Unclassified report

Descriptors: (*Magnetohydrodynamics, Cosmic rays), (*Geophysics, Solar radiation), (*Abstracting, Scientific research), Plasma medium, Magnetic fields, Magnetic storms.

Some 60 papers were published during the seven-year period covered by this final report. Most of these papers resulted from the work of the two academic staff members supported part time on this contract, E. N. Parker and J. A. Simpson. These papers covered both theoretical and experimental researches concerned with the properties of the interplanetary medium including magnetic fields and plasma density, the solar production of high energy particles and their propagation through the interplanetary medium, and selected topics on the properties of the geomagnetic field (geomagnetic storms, particle motions in the geomagnetic field, etc.). Included in this report is a list of publications, as well as abstracts of their contents. Also attached is a listing of the scientific and engineering staff who contributed to the work. (Author)

AD-437 873 Div. 25
OTS price $1.10

Microwave Lab., Stanford Univ., Calif.
A STUDY OF OPTICAL TRANSITION PROBABILITIES AND METHODS OF MODULATING THEM.
Semi-annual progress rept. 1 May-30 Sep 62,
by A. L. Schawlow, W. Moos, W. M. Yen, and G. F. Imbusch. Oct 62, 4p. Rept. no. 973
Grant DA ARO D31 124G326
Unclassified report

Descriptors: (*Selection rules, Symmetry (Crystallography)), (*Symmetry (Crystallography), Electric fields), Ions, Chromium, Magnesium compounds, Oxides, Optical phenomena, Excitation, Line spectrum.

AD-437 874 Div. 25
OTS price $1.10

Microwave Lab., Stanford Univ., Calif.
A STUDY OF OPTICAL TRANSITION PROBABILITIES AND METHODS OF MODULATING THEM.
Semi-annual progress rept. 2, 1 Oct 62-31 Mar 63.
May 63, 4p. Rept. no. 1036
Grant DA ARO D31 124G326
Unclassified report

Descriptors: (*Optics, Probability), (*Electric fields, Optics), Intensity, Theory, Symmetry (Crystallography).

AD-437 888 Div. 25
OTS price $11.00

United Nuclear Corp., White Plains, N. Y.
HIGH VELOCITY CONDENSING.
Rept. for 1 Mar 62-31 Jan 63,
by T. D. Hawkins and R. Hankel. Apr 64, 147p.
Rept. no. 5047
Contract AF33 657 8420, Proj. 3145, Task 314507
ASD TDR63 397 Unclassified report

Report on High Velocity Condensing.

Descriptors: (*Fluid flow, Condensation), Phase studies, Liquids, Vapors, Potassium, Water, Steam, Stagnation point, Pressure, Temperature, Subsonic flow, Supersonic flow, Compressible flow, Shock waves, Energy conversion, Rankine cycle, Pipes, Mathematical analysis, Theory, Steam condensers, Model tests.

A program has been conducted to investigate, analytically and experimentally, changes in stagnation conditions of a condensing fluid moving at high subsonic or supersonic velocities. The results of this investigation have shown that, under certain heat transfer and flow conditions, a rise in the stagnation pressure of the flowing stream can be achieved. The analytical studies have included homogeneous and nonhomogeneous flow models. Calculations of stagnation (pressure, temperature, and quality) have been performed for liquid-vapor mixtures of potassium and water using both flow models. Analysis has also been made of the change in stream properties of a two-phase mixture across a normal shock. An apparatus, using steam as the condensing fluid, was constructed to perform experiments for evaluating the changes in stagnation pressure predicted by the theory. Experimental data are in good agreement with the theory, and confirm the theoretical prediction that a net gain in stagnation pressure can be obtained under specified flow conditions. (Author)

26. PRODUCTION AND MANAGEMENT

AD-435 427 Div. 26, 16
OTS price $1.75

Beckman Instruments, Inc., South Pasadena, Calif.
A SMALL ROTARY VAPOR COMPRESSION STILL FOR THE PRODUCTION OF PYROGEN-FREE WATER.
Final rept.
1960, 59p.
Contract DA49 193MD2261
Unclassified report

Descriptors: (*Distilling plants, Water), Distillation, Centrifugal fields, Water supplies, Purification, Injection (Medicine), Pyrogens, Compressors, Compressor parts, Compressor rotors, Biological assay.

AD-435 516 Div. 26
OTS price $9.10

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
ELECTRON BEAM TECHNIQUES FOR FABRICATION AND ASSEMBLY OF PARTS FOR ELECTRON TUBES.
Quarterly rept. no. 2, 1 Oct-31 Dec 63,
by J. F. Dudenhoefer. 31 Dec 63, 110p.
Rept. no. EBR 133
Contract DA36 039AMC03625E
Unclassified report

Descriptors: (*Machining, Electron beams), (*Welding, Electron beams), (*Electron beams, Welding), Joints, Manufacturing methods, Electron tubes, Electron tube parts, Tests, Mechanical properties, Impact shock, Visual inspection, Vibration, Photographs, Electron tube heaters, Welds.

AD-435 521 Div. 26
OTS price $4.60

Hexcel Products Co., Berkeley, Calif.
DEVELOPMENT AND EVALUATION OF A LIGHTWEIGHT ALUMINUM HONEYCOMB CASE.
Progress rept. no. 2 for Feb 64,
by M. I. Kazimi. 10 Mar 64, 46p.
Contract DA04 200AMC477A, Proj. 6065
Unclassified report

Descriptors: (*Containers, Sandwich construction), (*Cylindrical bodies, Design), (*Honeycomb cores, Aluminum alloys), Sheets, Adhesives, Pressure vessels, Packing materials, Energy, Absorption, Density, Thickness, Compressive properties, Structural shells, Numerical analysis, Test methods.

Work was done on a predevelopment study, design of the prototype case, fabrication of tooling and test equipment, and engineering drawing release. The predevelopment study was conducted to evaluate the design data and concepts to be used in the prototype design. A primary result of this study was the determination that the 1.6 lb/cu ft density core is too strong to be used as an energy absorber. (Author)

AD-435 622 Div. 26, 17
OTS price $.50

Watervliet Arsenal, N. Y.
ELECTRODEPOSITION OF DISPERSION-STRENGTHENED GOLD - A1203 - ALLOYS,
by F. K. Sautter. Dec 63, 11p.
DA Proj. 1F5 23801A289 01
WVT RR6321 Unclassified report

Descriptors: (*Gold alloys, Dispersion hardening), (*Dispersion hardening, Elecrodeposition), Aluminum compounds, Oxides, Mechanical properties, Creep, Stresses, Heat treatment, Resistance (Electrical).

Gold - A1203 alloys have been electrodeposited with A1203 contents up to 4.36 vol. % from electrolytes operating at pH values between 5.0 and 12.0. The dispersion of the A1203 in Au resulted in an appreciable decrease in the creep rate at 200 and 300 C. Resistivity measurements showed no change in resistivity compared to that for the pure metal. (Author)

AD-435 688 Div. 26
OTS price $4.60

Republic Aviation Corp., Farmingdale, N. Y.
ELECTRO-SPARK EXTRUDING.
Interim technical engineering rept. no. 3,
1 Jan-1 Apr 64,
by J. Wagner. Apr 64, 44p. Rept. no. 2288
Contract AF33 657 11265, Proj. 8 111
ASD TR8 111, vol. 3 Unclassified report

Descriptors: (*Material forming, Extrusion), (*Capacitors, Electric discharges), (*Explosive forming, Steel), Shock waves, Hydrostatic pressure, Pressure vessels, Electromagnetic pulses, Loading (Mechanics), Design, Stresses.

The spark gap discharge phenomena as applied to experimental extrusion are reviewed. The equations derived for a thick walled cylinder under transient internal loading are applied to check the stress levels encountered in two proposed experimental extrusion devices. The strength requirements of the equipment are reviewed and analysed with both static and dynamic loading. A container concept is presented. (Author)

AD-435 774 Div. 26, 1, 12
OTS price $10.10

Massachusetts Inst. of Tech., Cambridge.
BASIC APPLIED RESEARCH IN FLUID POWER CONTROL.
Progress reports no. 5 and 6, 1 Feb-31 Sep 63.
Feb 64, 127p.
Contract AF33 657 7535, Proj. 8226, Task 822604
RTD TDR63 4252 Unclassified report

Descriptors: (*Hydraulic servomechanisms, Design), (*Pneumatic servomechanisms, Design), (*Gas bearings, Design), Accelerometers, Gases, Fluids, Pipes, Pressure, Damping, Pistons, Capillary tubes, Orifices, Valves, Journal Bearings, Tests, Vibration, Thrust bearings, Control systems, Flight control systems.

Technical results and progress are presented in several phases of continuing applied research and development related to the design and development of high-performance fluid control devices for advanced aerospace system. Continued emphasis is placed on pneumatic components and systems which are capable of performing over wide ranges of temperature and in the presence of intense radiation. Current work is described in the Engineering Projects Laboratory dealing with a new pneumatic pulse actuation servo system, a gas-operated accelerometer, the dispersion of transients in fluid transmission lines, compressible dampers, negative-stiffness flapper valves, and gas-lubricated bearings. (Author)

AD-436 023 Div. 26, 17
OTS price $3.60

Lockheed Missiles and Space Co., Sunnyvale, Calif.
JOINING OF BERYLLIUM AND ITS ALLOYS BY WELDING AND/OR BRAZING: AN ANNOTATED BIBLIOGRAPHY,
by Jack B. Goldmann. Aug 63, 38p. Special bibliography 3 80 63 6.
Contract NOrd17017

Unclassified report

Descriptors: (*Bibliographies, Joining), (*Joining, Bibliographies), (*Beryllium, Joining), (*Beryllium alloys, Joining), Welding, Brazing, Abstracts, Indexes.

Intense investigation has been made of the problem of the joining of beryllium and its alloys either by welding and/or brazing during the past three years, 1960-1963. This annotated bibliography is the result of the examination of printed matter for that period as found in the Journal and report literature. The resources of the Lockheed Missiles & Space Company Technical Information Center were utilized in the preparation of this bibliography. (Author)

AD-436 098 Div. 26, 17
OTS price $1.10

General Electric Co., Schenectady, N. Y.
AN INVESTIGATION OF THE NATURE OF STRUCTURAL DAMAGE IN METAL-FORMING PROCESSES.
Progress rept. no. 5, 18 Feb-17 Apr 64,
by H. C. Rogers, L. F. Coffin, Jr. and R. C. Leech. Apr 64, 4p. Rept. no. 64GC0272M
Contract NOw63 0671c

Unclassified report

Descriptors: (*Material forming, Metals), (*Copper, Material forming), Structures, Damage, Drawing (Machine processing), Rolling (Metallurgy), Fracture (Mechanics), Cold working, Microstructure, Grain boundaries, Aluminum alloys, Brass, Ductility, Density, Dies, Lubricants.

AD-436 260 Div. 26, 17
OTS price $6.60

General Dynamics, Fort Worth, Tex.
ELECTROFORMING REFRACTORY METAL ALLOYS,
by E. W. Turns and J. F. Hildebrand. 15 Apr 64, 69p. Rept. no. ERR FW217
Contract AF33 657 11214

Unclassified report

Descriptors: (*Retractory metal alloys, Electroforming), (*Electroforming, Refractory metal alloys), Cobalt alloys, Nickel alloys, Tungsten alloys, Electroplating solutions, Heat treatment, Mandrels, Material forming, Tensile properties, Hardness, Wear resistance, Oxidation, Salt spray tests, Temperature, Microstructure, Manganese alloys.

Twenty-six solutions capable of electrodepositing alloys were prepared, electroreduced, and the products examined for uniformity, control of alloy ingredient, and solution stability. In the second phase three solutions were selected from the screening test. Limited experiments were conducted with a nickel manganese alloy, while more extensive experiments were performed with a Co-W and a Co-W-Ni solution. In the third phase the latter two were adapted and improved to function as true electroforming solutions. Test specimens of a cobalt-nickel-tungsten alloy were prepared and tested to obtain tensile strength and hardness data. (Author)

AD-436 262 Div. 26, 15
OTS price $3.60

Mechanical Technology Inc., Latham, N. Y.
THE STATIC AND DYNAMIC CHARACTERISTICS OF THE SPIRAL-GROOVED THRUST BEARING,
by S. B. Malanoski and C. H. T. Pan. 15 Mar 64, 37p. Rept. no. 64TR11
Contract Nonr3730 00

Unclassified report

Descriptors: (*Thrust bearings, Dynamics), (*Physical properties, Loading (Mechanics)), Force (Mechanics), Mathematical models, Tables, Lubrication, Configuration, Physical properties, Tables, Stability, Oscillation.

A generalized analysis for spiral-grooved thrust bearings is presented. The effect of local radius is considered. For the same inside-to-outside radius ratio, the inflow design is shown to be superior in the load capacity. The analysis also treats a relative, transverse, oscillatory motion of the bearing surfaces. Both the magnitude and phase angle (in the temporal sense) of the bearing reaction are dependent on the frequency of the motion. The results for the oscillating motion reveal the possibility of a self-excited, rotor-bearing instability. The criterion for determining the onset of this type of instability is given. (Author)

AD-436 263 Div. 26, 15
OTS price $4.60

Mechanical Technology Inc., Latham, N. Y.
CHARACTERISTICS OF HERRINGBONE-GROOVED, GAS-LUBRICATED JOURNAL BEARINGS,
by John H. Vohr and C. Y. Chow. 2 Apr 64, 44p. Rept. no. 64TR15
Contract Nonr3730 00, Task NR061 131

Unclassified report

Descriptors: (*Journal bearings, Lubrication) (*Lubrication, Gases), (*Gases, Lubrication), (*Load distribution, Journal bearings), (*Differential equations, Load distribution), Physical properties, Pressure, Programming (Computers), Configuration, Compressive properties, Mathematical models.

A differential equation is obtained for the smoothed overall pressure distribution around a herringbone-grooved, gas-lubricated, journal bearing operating with a variable film thickness. The equation is based on the limiting case of an idealized bearing for which the number of grooves approaches an infinite number. A numerical solution to the differential equation is obtained valid for small eccentricities. This solution includes the case where the journal is undergoing steady circular whirl. In addition to the usual plain bearing parameters L/D and lambda, the behavior of a grooved bearing also depends on four additional parameters: The groove angle beta, the relative groove width alpha, the relative groove depth H sub o, and a compressibility number, lambda sub s, which is based on the relative speeds of the grooved and smooth members of the bearing. Results are presented showing bearing radial force and attitude angle as functions of beta, alpha, H sub o, the compressibility number lambda, and also whirl speed ration. (Author)

AD-436 667 Div. 26
OTS price $1.60

Republic Aviation Corp., Farmingdale, N. Y.
ELECTRO-SPARK EXTRUDING.
Interim technical engineering rept. no. 1, 1 July-1 Oct 63.

by G. Pfanner and J. H. Wagner. Oct 63, 20p.
Rept. no. 1776
Contract AF33 657 11265, ASD Proj. 8 111
ASD TR8 111, vol. 1 Unclassified report

Descriptors: (*Materials forming, Extrusion), (*Electric discharges, Capacitors), Explosive forming, Hydrostatic pressure, Underwater explosions, Steel, Pressure vessels, Containers, Design, Shock waves, High pressure research, Hydraulic presses, Pipes, Metals, Electrodes, Elasticity, Plasticity, Hydraulic systems, Hydraulic pumps, Stresses, Mathematical analysis.

A literature survey in capacitor discharge extrusion and dynamic effects of shock loading was completed. A stress analysis considering the effect of explosive shock type loadings is nearing completion. The objective of the program is to extrude steel to 1/4 in. rounds by the use of capacitor discharge energy. Pressure chamber requirement is a vessel which must hold hydrostatic pressure of 200,000 psi and be capable of containing shock energy from a 155,000 joule capacitor discharge. (Author)

AD-436 822 Div. 26, 14
OTS price $10.10

Piezo Crystal Co., Carlisle, Pa.
PRODUCTION ENGINEERING MEASURE. COMPLETION REPORT STEP I. MANUFACTURE OF CR(XM-41)/U FILTER CRYSTAL UNITS 10 MC, 11.5 MC, 15 MC, 20 MC, 30 MC.
1964, 128p,
Contract DA36 039sc85956
Unclassified report

Original contains color plates: All DDC reproductions will be in black and white. Original may be seen in DDC Hq.

Descriptors: (*Quartz, Single crystals). (*Production, Manufacturing methods). Specifications, Crystal filters, Crystal holders, Tests, Quality control, Visual inspection, Materials, Capacitance, Engineering.

AD-436 883 Div. 26
OTS price $12.50

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
EVALUATION OF A 20,000 PSI GUERIN PROCESS.
Interim rept. no. 8 (Final), 6 Sep 62-6 Feb 63,
by Arthur W. Wiegand and Steve H. Lee.
6 Feb 63, 173p.
Contract NOw610128
Unclassified report

Descriptors: (*Material forming, High-pressure research), (*Sheets, Material forming), Hydraulic presses, Rubber, Aluminum alloys, Steel, Titanium alloys, Stainless steel, Tool steel, Experimental data, Airframes, Structural parts.

Forming of the requisite specimens was completed. The data obtained from the evaluation of these parts are presented on the same axes as the theoretical formability curves. Data relating springback to rubber pressure, and results of rubber forming tests at 20,000 psi using specimens and tooling provided for high energy impact tests are also included. The theoretical aspect of formability is presented along with the conclusions and discussions derived from this work. (Author)

AD-437 109 Div. 26
OTS price $1.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
AUTOMATIC D. C. TIG WELDING SATURN S-IVB FITTINGS,
by J. Haryung and R. S. Wroth. 11 Feb 64, 18p.
Rept. no. SM44652
Unclassified report

Descriptors: (*Welds, Quality control), (*Welds, Fittings), (*Fittings, Welding), Experimental data, Tests, Mechanical properties, Tables, Production, Joints, Automatic.

Inherent problems were experienced in manual MIG welding Saturn DSV-4 fittings to domes. Repairs, especially at weld starts and tie-offs, were frequent and costly. In order to upgrade weld quality and to further automate Saturn S-IVB production, the automatic D.C. TIG process was implemented for fitting-to-dome welding. This program was established to generate D. C. TIG process data and to develop capability for production weldings of fittings to domes. Weld tests were performed both in the laboratory and in the production shop. These tests demonstrated that the D. C. TIG process eliminated many of the difficulties associated with Manual MIG welding of fittings to domes. (Author)

AD-437 113 Div. 26, 17, 12
OTS price $2.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
REINFORCED STRUCTURAL COMPOSITES.
Interim rept.,
by F. M. Smith. 17 Feb 64, 27p. Rept. no. SM44666
Unclassified report

Descriptors: (*Tungsten, Material forming), (*Vapor plating, Tungsten), (*Material forming, Tungsten), Wires, Mandrels, Stresses, Mechanical properties, Pipes, Cylindrical bodies, Tungsten compounds, Fluorides, Hydrogen, Guided missiles, Composite materials.

A technique of fabricating W bodies of increased strength was sought. Vapor deposition of unstressed W on stressed W wires was selected as the method for attaining the objective of the program. Equipment was designed and constructed for the vapor deposition of W metal from a gaseous mixture of WF6 and H onto a heated mandrel surface. A set of operating conditions was developed for the deposition of high quality W in the form of tubes of one inch outside diameter. While these tubes had good microstructures, taper existed in the wall thickness. Two tubes were fabricated which were reinforced longitudinally with stressed W wires. The microstructure of the W deposited around the wires was influenced by the presence of the wires. Deposition was initiated from the mandrel and wire surfaces. The technology of producing reinforced tubes was not developed to the point of initiating testing. (Author)

AD-437 220 Div. 26, 17, 1
OTS price $10.50

Boeing Co., Seattle, Wash.
WELDING CHARACTERISTICS, EXHIBIT ''D''.
Quarterly progress rept. no. 2, 1 Oct-31 Dec 63.
2 Jan 64, 132p. Rept. no. BNJV DQ2
Contract AF33 657 11461
Unclassified report

Descriptors: (*Supersonic planes, Materials), (*Nickel alloys, Welding), (*Stainless steel, Welding), (*Titanium alloys, Welding), (*Welds, Mechanical properties), Microstructure, Tensile properties, Fatigue (Mechanics), Temperature, Distribution, Shear stresses, Cryogenics, Fracture (Mechanics), Toughness, High-temperature research, Sheets, Metal plates, Arc welds, Electron beams, Spot welds, Resistance welding, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Chromium alloys, Iron alloys, Transport planes, Design, Tables.

This report describes the work accomplished for the determination of Welding Characteristics of selected SST skin materials. The scope of the program involves the evaluation of Inconel 718 (20 percent cold reduced), 8Al-1Mo-1V Titanium Alloy (duplex annealed), PH14-8Mo (SRH 1050) and 6Al-4V Titanium Alloy (annealed for weldability and welded joint strength using fusion welding and resistance welding techniques. A literature survey has been conducted to systematically and objectively review and tabulate known welding and brazing techniques and characteristics. The welding characteristics studies are underway with preliminary data presented also the base material and weld tests completed to date are reported. (Author)

AD-437 248 Div. 26, 17
OTS price $2.60

General Dynamics/Fort Worth, Tex.
MATERIAL - AMS 6434 STEEL, 180-210 KSI HEAT TREAT WELD REPAIR - FATIGUE TEST OF.
Test rept., 3 Nov 60-1 June 62,
by S. V. Glorioso. 15 Apr 64, 27p. Rept. no. FGT 2956
Contract AF33 600 41891 Unclassified report

Descriptors: (*Steel, Arc welds), (*Welds, Fatigue (Mechanics)), Stresses, Heat treatment, Cold working, Tensile properties, Sheets, Wings.

To reduce scrap rates and delivery delays, B-58 wing pylon boxes, P/N 4W3306, were being repair welded to build up areas which had been machined undersize. This test program was originated to determine the effect of these repair welds on the tensile, impact, and axial fatigue properties of .090 in AMS 6434 steel used for the assemblies. Butt welds and welds with 50% penetration into the parent metal were examined. Primarily arc weld techniques using Arcoloy 502 coated electrodes were evaluated, although TIG welds were also tested in fatigue. Post welding procedures of stress relieving, shot peening or reheat treatment were evaluated. (Author)

AD-437 306 Div. 26, 17
OTS price $3.60

Allegheny Ludlum Steel Corp., Brockenridge, Pa.
EXTRUDING AND DRAWING MOLYBDENUM TO COMPLEX THIN H-SECTION.
Interim technical engineering rept. no. 2, 1 Oct-31 Dec 63,
by P. A. Santoli. Jan 64, 38p.
Contract AF33 657 11203, Proj. 8 112
RTD TR8 112, vol. 2 Unclassified report

Descriptors: (*Molybdenum alloys, Extrusion), (*Extrusion, Molybdenum alloys), (*Drawing (Machine processing), Molybdenum alloys), Sintering, Dies, Lubrication, Ceramic coatings, Zirconium compounds, Oxides, Microstructure, Surfaces, Processing, Titanium alloys, Zirconium alloys, Hardness, Grain structures (Metallurgy).

Sixteen solid round extrusions of TZM were made primarily to determine suitable die materials. Reduction ratios at 45:1 and 55:1 were accomplished from a billet heating temperature range of 3000 to 3500 F. Extrusion dies were prepared with flame-sprayed zirconia deposits on AISI H-13 tool steel and with pressed and sintered solid zirconia nibs. Good extrusion results were obtained with the use of .025 and .035-inch sprayed zirconia at a reduction ratio of 45:1. Extrusions at 55:1 were poor regardless of sprayed coating thickness and billet heating temperature. Good extrusion results were also obtained with pressed and sintered solid zirconia nibs at a reduction ratio of 45:1. Extrusion tooling performed well up to 237,000 psi liner pressure except for noticeable wear which occurred at the liner working surface. On the basis of good surface quality and dimensional runout on round extrusions, H-shaped dies will be prepared with .035-in. flame-sprayed zirconia as well as with pressed and sintered solid zirconia. (Author)

AD-437 323 Div. 26, 25
OTS price $7.60

Dayton U. Research Inst., Ohio.
INVESTIGATIONS OF BALLISTIC-PISTON AND LIQUID DRIVEN PISTON COMPRESSORS FOR THE PRODUCTION OF HIGH TEMPERATURE AND HIGH DENSITY GASES,
Interim technical documentary rept. 15 Jun 62-14 Jun 63,
by John E. Minardi and Robert B. Schwartz. Aug 63, 76p.
Contract AF33 657 8975, Proj. 7116, Task 7116 01
ARL 63 167 Unclassified report

Descriptors: (*Gasses, Production), (*Compressors, Operation), Theory, Compressor parts, Pistons, Pressure, Entropy, Analysis, Stability, Performance (Engineering), Shock tubes.

Research on systems for the production of high temperature and high density gases is being conducted by the University of Dayton Research Institute to determine the feasibility of various pressure energy exchange apparatus to produce isolated high temperature and high pressure gas. The subject of this technical note is the theoretical annalysis and experimental test program conducted to gain insight into the operation of ballistic-piston compressors, and the continuation of effort toward the development of liquid driven gas compression systems. The analysis adopted to determine the parameters affecting the maximum performance of the ballistic-piston compressors, and the continuation of eeffort toward the development of liquid driven gas compression systems. The analysis adopted to determine the parameters affecting the maximum performance of the ballistic-piston compression process has been divided into two cases. A heavy piston treatment, which considers the charge gas compression to be polytropic, is presented for compressions in which the irreversibilities induced into the charge gas by pressure waves may be considered negligible. If the entropy increases associated with these waves are not negligible a light piston analysis is required. (Author)

AD-437 467 Div. 26, 14, 1
OTS price $11.50

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
AN EXPERIMENTAL INVESTIGATION OF THE FATIGUE LIFE AND LIMIT LOAD CHARACTERISTICS OF NEEDLE ROLLER BEARINGS UNDER OSCILLATING LOAD CONDITIONS.
Rept. for Mar 56-Sep 63,

by J. S. Tawresey and W. W. Shugarts, Jr.
Mar 64, 153p. Rept. no. F A 1913
Contract AF33 616 3589, Proj. 1D121401A14414
SEG TDR64 4 Unclassified report

Descriptors: (*Roller bearings, Fatigue (Mechanics)), (*Bearings, Helicopter rotors), (*Helicopter rotors, Roller bearings), Lubrication, Loading (Mechanics), Life expectancy, Test equipment, Reliability, Instrumentation, Tests, Performance (Engineering), Greases, Oils, Failure (Mechanics), Monitors, Torque, Hydraulic systems.

This investigation was made to determine, by test of full scale bearings, the factors influencing life of a bearing in cyclic oscillation, as encountered in helicopter rotor hinges. A field survey was made to guide selection of an appropriate size and type of bearing for test and establish the principal operating variables. A machine was designed, a prototype unit was built and tested, followed by the construction of seven additional machines. Four test bearings were run simultaneously in each machine, under essentially identical conditions. Each test bearing was subjected to fixed conditions of load, speed, amplitude of oscillation, and lubrication. It was run continuously until evidence developed of incipient failure in the form of spalling or flaking breakout of the raceways. The elapsed time in test prior to failure, marks the life of the bearing. The well known and characteristic deviation of individual bearing lives, within a group of bearings, was evident in all test runs. Approximately 750 bearings were tested in 25 different test runs, comprising a systematic combination of operating variables. (Author)

AD-437 477 Div. 26, 32
OTS price $4.60

PERT Coordinating Group, Washington, D. C.
COMMON PROBLEMS ASSOCIATED WITH IMPLEMENTATION AND OPERATION OF THE PERT COST SYSTEM.
1964, 46p.
PERT TP1 Unclassified report

Descriptors: (*Costs, Management engineering), (*Management engineering, Costs), Budgets, Decision making, Scheduling, Time, Data processing systems.

AD-437 606 Div. 26, 17
OTS price $2.60

Materials Advisory Board, National Research Council, Washington, D. C.
RECOMMENDED QUALITY STANDARDS FOR TUNGSTEN SHEET PRODUCED IN THE REFRACTORY METALS SHEET ROLLING PROGRAM.
1964, 26p. Rept. no. 196M
Contract SD118
Unclassified report

Descriptors: (*Tungsten, Quality control), (*Quality control, Specifications), Sheets, Tensile properties, Sampling, Test methods, Metallography, Hardness.

This revised sheet quality 'specification' differs from MAB-184-M (Report of the Subpanel on Quality Specifications) in that it is limited to tungsten, and includes tensile property minimum values. These tensile minimums reflect realistic producer capabilities and as such should be of particular interest to aerospace weapons designers. These quality standards apply in general to sheet which is to be used in the as-furnished condition. Quality sampling specifications for plate, such as would be used in shear spinning, are covered in another publication (MAB-190-M). Sheet destined for drastic working operations, such as cupping or drawing, might require a different microstructure (retaining a greater capacity for additional deformation) than that corresponding to the material in this report. (Author)

AD-437 684 Div. 26, 17
OTS price $8.10

Standard Pressed Steel Co., Jenkintown, Pa.
STRUCTURAL FASTENING TECHNOLOGY.
Progress rept. no. 1, July-Oct 63,
by E. F. Gowen, Jr. and M. Ortner. 4 Nov 63, 81p.
Contract AF33 657 11684
Unclassified report

Descriptors: (*Mechanical fasteners, Refractory metal alloys), (*Refractory coatings, Mechanical fasteners), Reentry vehicles, Niobium alloys, Niobium, Tantalum, Molybdenum alloys, Bolts, Screw threads, Rivets, X-ray diffraction analysis, Mechanical drawings, Electrophoresis, Silicides, Oxidation, High-temperature research.

A survey of available refractory materials, user refractory fastener requirements, and refractory coatings was conducted. The results of the survey and resultant recommendations are included in the report. Work was started at Vitro on the actual requirements of a coated refractory fastener in a joint. TZM material with Vitro coating was used. Additional work will be forthcoming on this. Fasteners of Cb 752 were supplied to Martin Baltimore for a structural applications study. Additional Cb 752 is on order for coating studies and a test program on electrophoretically coated threaded fasteners for mechanical properties through 2800 F. (Author)

AD-437 752 Div. 26, 10
OTS price $2.60

Aerojet-General Corp., Sacramento, Calif.
NEW DEVELOPMENTS IN CONTINUOUS PROPELLANT PROCESSING FOR THE POLARIS PROPULSION SYSTEM.
Rept. for period ending Nov 63,
by L. G. Schwieger. 19 Dec 63, 29p. Rept. no. 0178 07M10
Contract NOrd18171
Unclassified report

Descriptors: (*Management engineering, Solid rocket propellants), (*Production, Solid rocket propellants), (*Solid rocket propellants, Production), Quality control, Instrumentation, Processing, Refractometers, Radiography.

ANALYTICAL INSTRUMENTATION: Both the nondispersive X-ray and reflectance refractometer were moved to the pilot plant for a run. Both units are undergoing final evaluation tests, and specific results were presented on brabender produced propellant for the reflectance refractometer. An analysis of variance was made on the 2 x 3 factorial design and signficance of premix and final fuel levels determined. CLOSED LOOP CONTROL: The dynamic response analysis on the oxidizer loop is nearly finished. This report presents the response equations and the theoretical controller settings on the oxidizer feeder. PROPELLANT PROCESSABILITY AS A FUNCTION OF SOLIDS PARTICLES: This subtask was completed and the final report is now being written. Specific recommendations on using the equipment for viscosity measurements will be documented. CONTINUOUS CASTING: This subtask was completed but the final report is being held for inclusion in the final report on the Task 6 program. (Author)

27. PROPULSION SYSTEMS

AD-435 446 Div. 27, 14, 26
OTS price $1.10

National Carbon Co., New York.
(No title).
Summary technical progress rept. Feb-Nov 63.
Nov 63, 4p.
Contract AF04 611 8383, Proj. 623A
Unclassified report

Descriptors: (*Rocket motors (Solid propellants), Nozzle inserts), (*Nozzle inserts, Graphite), Rocket motor nozzles, Production, Processing, High temperature research, Cylindrical bodies, Graphited materials, Feasibility studies, Heat treatment, Manufacturing methods, Impregnation.

AD-435 834 Div. 27, 17
OTS price $4.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
FEASIBILITY DEMONSTRATION OF A TRANSPIRATION COOLED NOZZLE SYSTEM.
Interim rept. no. 3, 15 Dec 63-14 Mar 64.
14 Mar 64, 49p. Rept. no. ER5209Q3
Contract AF04 611 9071, Proj. 3059, Tasks 305907, 305913
RPL TDR64 42 Unclassified report

Descriptors: (*Rocket motor nozzles, Sweat cooling), Design, Tungsten, Porous metals, Heat transfer, Rocket motors (Solid propellant), Feasibility studies, Materials, Nozzle inserts, Reinforcing materials, Sintering, Electron beams, Welding, Tantalum, Graphite, Steel, Temperature, Ammonia, Rings, Stresses, Tests, Test equipment, Nitrogen, Erosion, Cooling, Manufacturing methods, Permeability.

The design, analysis, and fabrication is presented for a porous-tungsten transpiration cooled, test module. Specific accomplishments included the following: the design and analysis for the first throat module test was completed, including verification of the joining method selected, fabrication of the module components has been completed and final assembly has been initiated, simulated test runs using liquid NH3 have been made to verify cooling system operation, and bench tests to verify pressure shock loading, infiltrated graphite performance, hydrogen-tantalum reactivity, and cooling effectivity were completed. (Author)

AD-435 855 Div. 27
OTS price $3.60

Pennsylvania U., Philadelphia.
INVESTIGATION OF A STRATIFIED CHARGE ENGINE EMPLOYING THE AIR SWIRL INDUCED STRATIFICATION PRINCIPLE. THEORETICAL AND EXPERIMENTAL INVESTIGATIONS.
Interim rept. 9 Mar 62-31 Mar 64,
by D. A. Willis and W. E. Meyer. Mar 64, 31p.
Contract DA36 034ORD3638T
Unclassified report

Descriptors: (*Internal combustion engines, Fuel injection), (*Fuel injection, Air), Fuel injectors, Secondary injection, Combustion chamber gases, Mixtures, Fuel systems, Fuel sprays, Turbulence, Configuration, Design, Tests, Operation, Effectiveness, Valves, Solenoids, Injection, Performance (Engineering), Vortices, Laminar flow.

AD-435 877 Div. 27, 12
OTS price $6.60

Rocketdyne, Canoga Park, Calif.
DEVELOPMENT OF PROPELLANT UTILIZATION VALVE SWITCH BOX ASSEMBLIES AND RELATED HARDWARE FOR THE ATLAS MA-5 PROPULSION SYSTEM.
Final rept.
16 Apr 64, 69p. Rept. no. R5585
Contract AF04 685 306
Unclassified report

Descriptors: (*Rocket motors (Liquid propellant), Valves), (*Valves, Electric switches), Design, Tests, Guided missiles (Surface-to-surface), Fuel systems, Wiring diagrams, Electric cables, Transducers, Reliability, Vibration, Performance (Engineering), Liquid rocket propellants.

A description and results are presented of a program conducted to design, fabricate, and test the hardware necessary to provide MA-5 propulsion system compatibility with the 400- and 4500-cps propellant utilization system. (Author)

AD-436 272 Div. 27, 14
OTS price $15.00

Aerojet-General Corp., Azusa, Calif.
IMPROVED FILAMENT-WOULD CONSTUCTION FOR CYLINDRICAL PRESSURE VESSELS, VOLUME I. STRUCTURAL ANALYSIS AND MATERIALS AND PROCESSES.
Rept. for 1 July 61-31 Jan 64,
by F. J. Darms, R. Molho and B. E. Chester.
Mar 64, 226p. Rept. no. 2784
Contract AF33 616 8442, Projs. 7340, 7381, Tasks 734003, 738101
RTD ML TDR64 43, vol. 1
Unclassified report

Rept. on Non-metallic and Composite Materials and 'aterials application.

Descriptors: (*Rocket cases, Filament wound constuction), (*Pressure vessels, Design), (*Filament wound constuction, Cylindrical bodies), Glass textiles, Mandrels, Hydrostatic pressure, Failure (Mechanics), Physical properties, Buckling (Mechanics), Plastics, Epoxy plastics, Combustion chamber liners, Synthetic rubber, Stresses, Structures, Mathematical analysis.

A design-optimization program was conducted that included stress analyses and the determination of design parameters, winding patterns, and fabrication techniques for filament-wound, cylindrical, pressure vessels. An investigation of the materials, processes, and structural analyses required to efficiently utilize the improved mechanical properties of new glass fibers was also conducted, with the aim of improving filament-wound composite structures. (Author)

D-436 289 Div. 27, 30, 25
OTS price $14.00

Oklahoma State Univ., School of Mecnanical Engineering, Stillwater, Okla.
A STUDY OF ULTRASONICS FOR FLAW DETECTION IN TURBOJET ENGINES.
Fianl rept.
1964, 208p.
Contract AF34 601 14090
Unclassified report

Report on Nondestructive testing study.

Descriptors: (*Turbojet engines, Compressor blades), (*Compressor blades, Ultrasionic

radiation), (*Ultrasonic radiation, Nondestructive testing), Paints, Corrosion inhibition, Fatigue (Mechanics), Ultrasonic properties, Test methods, Reflection, Transducers, Standards, Surface properties, Orifices, Damping, Metal plates, Refraction, Maintenance, Cleaning, Tests, Test equipment, Ultrasonic properties, Checkout procedures, Mechanical properties, Calibration, Detection.

Ultrasonic inspection methods are presented for compressor blades of turbojet engines. The main emphasis was placed on the development of transducers for the inspection of the compressor blades of the J-79 and J-71 engines. Much of the work done was concerned with the development of a usable surface wave standardization system. A unique type of calibration block was developed making possible the accurate calibration of transducers and the calibration of the reject level and gain settings of the pulse-echo system. (Author)

AD-436 296 Div. 27, 30
OTS price $10.50

PHILCO Research Lab., Newport Beach, Calif.
A REVIEW OF NOZZLE CONCEPTS FOR FUTURE SOLID PROPELLANT ROCKET MOTORS.
Special technical rept.,
by W. H. Armour, R. L. Mitchell, W. L. Smallwood and E. W. Peterson. Mar 64, 132p. Rept. no. SP U2551
Contract AF04 611 8387, Proj. 3059, Task 305907
RPL TDR64 8 Unclassified report

Descriptors: (*Rocket motor nozzles, Cooling), Rocket motors (Solid propellant), Heat transfer, Corrosion, Liquid metals, Thermal insulation, Heat-resistant materials, Convection, Erosion, High temperature research, Nozzle inserts, Film cooling, Refractory materials, Tungsten, Plastics, Reinforcing materials, Sweat cooling, Design, Configuration, Combustion, Ablation, Spalling, Graphite, Thermodynamics, Air cooled, Convection, Coolants.

This report is based on analyses and experiments performed under a contract entitled, Applied Research for Advanced Cooled Nozzles. A review is given of heat transfer and corrosion analyses, materials, and thermal protection methods for both cooled and uncooled rocket nozzles for present and future solid propellant rocket motors. Many of the details pertaining to this work can be found in report literature. Only the more pertinent aspects pertaining to rocket nozzles are presented. (Author)

AD-436 438 Div. 27
OTS price $1.60

Aerojet-General Corp., Sacramento, Calif.
INVESTIGATION OF FILAMENT WINDING PATTERNS.
Bimonthly progress rept. no. 5, 24 Dec 63-24 Feb 64.
27 Mar 64, 13p. Rept. no. 0627 1 5
Contract NOw63 0627c
Unclassified report

Descriptors: (*Rocket cases, Filament wound construction), (*Filament wound construction, Rocket cases), Pressure vessels, Deformation, Hydrostatic pressure, Failure (Mechanics), Design, Experimental data.

Progress is reported on a program conducted to increase the understanding of the interrelation between chamber winding patterns and chamber behavior. All of the ten units originally included in Phase I of this program were hydrostatically tested and the data analyzed. The design of the deformation-control-evaluation chamber for Phase II of the program was initiated on the basis of a developed orthotropic analytical approach modified to reflect the changes that occur in orthotropic properties with load. (Author)

AD-436 440 Div. 27, 14
OTS price $3.60

Aerojet-General Corp., Sacramento, Calif.
DEVELOPMENT OF IMPROVED RESIN SYSTEMS FOR FILAMENT-WOUND STRUCTURES.
Bimonthly progress rept. no. 4, 10 Nov 63-10 Jan 64,
by J. J. Cooney. 12 Feb 64, 36p. Rept. no. 0627VI4
Contract NOw63 0627c
Unclassified report

Descriptors: (*Rocket cases, Filament wound construction), (*Filament wound construction, Binders), (*Plastics, Aging (Materials)), Additives, Physical properties, Statistical analysis, Mechanical properties, Amines, Aromatic compounds, Anilines, Anhydrides, Phthalic acids.

This report presents results of statistical analyses of property data obtained for resin systems cured with m-phenylenediamine and 4,4'-methylenedianiline, and results of property tests conducted on systems cured with ethylenediamine and hexahydrophthalic anhydride. (Author)

AD-436 644 Div. 27
OTS price $1.60

Ogden Air Materiel Area, Hill AFB, Utah.
ROCKET MOTOR 14-DS-1000, MK 4 MOD 2 AND M8 MODELS,
by George H. Kawanishi. Apr 64, 18p.
OOY TR64 759 Unclassified report

Descriptors: (*Rocket motors (Solid propellant), Storage), (*Jatos, Acceptability), Life expectancy, Captive tests, Jatos, Rocket propellant grains, Solid rocket propellant grains, Nitrocellulose, Nitroglycerine, Triacetin, Rocket igniters, Weight, Interior ballistics, Performance (Enigneering), Thrust, Time, Temperature.

This project was established to determine if the shelf life of the 14-DS-1000 Rocket Motor could be extended by establishing new low temperature limits. Samples ranging in age from 91 months to 116 months were brought in from field storage, inspected, temperature conditioned and static fired. Motors, conditioned at -30, -20, and -10 F produced an after-burning phenomenon. The 14-DS-1000 Rocket Motor M8 and MK 4 Mod 2 performed satisfactorily at -30 to -10 F during normal burning. It is recommended that the shelf life of this item be extended 10 years with firing temperature limits of -10 to +140 F. (Author)

AD-436 750 Div. 27, 1
OTS price $18.00

AiResearch Mfg. Co., Phoenix, Ariz.
HELICOPTER TRANSIENT PERFORMANCE WITH FREE TURBINE AND SINGLE-SHAFT GAS TURBINE ENGINES.
Final engineering rept.
14 Feb 64, 281p. Rept. no. CA5120R
Contract NOw630578C
Unclassified report

Descriptors: (*Helicopters, Performance (Engineering)), (*Gas turbines, Helicopter engines), Control systems, Velocity, Time, Helicopter rotors, Hovering, Thrust, Jet engine fuels, Fluid flow, Torque, Stalling, Gas generating systems, Flight testing.

The study was conducted for purposes of quantitatively evaluating the relative helicopter system dynamic performance with single shaft versus free turbine type gas turbine power plants. Three engines were selected of different power classes for which detailed engine performance maps were provided. These were the T-58, T-50, and T-64 free turbine type engines which were analyzed with respect to appropriate rotors and helicopter gross weights as free turbine type engines and as single shaft engines. The latter configuration was accomplished by gearing the free turbine to the gas generator with a gear ratio appropriate to the design speeds of the gas generators and free turbine. The two configurations, original free turbine and conversion to single shaft by gearing, are treated for each of the three basic engines. (Author)

AD-436 795 Div. 27, 30
OTS price $18.50

Foreign Tech. Div. Air Force Systems Command Wright-Patterson Air Force Base, Ohio
TESTING AIR-BREATHING ENGINES,
by V. M. Dorofeyev and V. Ya. Levin. 28 Jan 64, 29p.
FTD TT63 233 Unclassified report

Trans. from Ispytaniya Vozdushno-Reaktivnykh Dvigateley, pp. 1-220, 1961.

Descriptors: (*Jet engines, Test facilities), (*Meters, Design), Test methods, Measurement, Measuring devices (Electrical and Electronic), Test equipment, Instrumentation, Errors, Manometers, Thermometers, Thermoelectricity, Temperature sensitive elements, Flowmeters, Dynamometers, Tachometers, Vibration, High altitude, Simulation, Tests, Turbines, Compressure, Fuel systems, Fuel filters, Flight testing, Textbooks, Turbojet engines, USSR.

Various aspects of the testing of air-breathing jet engines are discussed in this book. Techniques and methods of processing data, and the measuring instruments, devices and equipment of laboratories and testing stations are described. (Author)

AD-436 807 Div. 27, 10
OTS price $13.00

Pratt and Whitney Aircraft, West Palm Beach, Fla.
STUDY OF TURBOJET MAIN BURNERS FOR USE WITH CONTAMINATED FUEL.
Monthly progress rept. no. 10, 1-31 Mar 64, by Stanley A. Mosier. 10 Apr 64, 186p. Rept. no. FR973
Contract NOw63 0489d
Unclassified report

Descriptors: (*Turbojet engines, Combustion chambers), (*Combustion chambers, Combustion), Captive tests, Fuel consumption, Specifications, Heat transfer coefficients, Fuel contamination, Fuel nozzles, Feasibility studies, Tables, Jet engine fuels, Combustion deposits, Temperature.

Thirty-three tests totaling 34.6 hours were made with three rig builds of the vaporizing center tube burner can. Rig 20621-1 accumulated 8.5 hours of operating time using contaminated JP-5 fuel; rig 20621-2 accumulated 16 hours of operating time using clean JP-5 fuel; and rig 20621-3 accumulated 10.1 hours of operating time using clean JP-5 fuel. None of the burner cans showed any damage after testing. One tube was operated for 5.25 hours using MIL-E-5007B contaminated JP-5 fuel. From this limited testing, it appears that contaminants have no effect on increasing the rate of carbonaceous deposit buildup on tube internal walls, or in varying significantly the fuel heat transfer coefficients during testing. The effect of carbonaceous deposits on heat transfer coefficients, in general, is to reduce the coefficient. A correlation between deposit thickness, deposit location and variation in coefficient is being sought, using the data obtained in this study. This will be discussed further in the progress report for the next report period. (Author)

AD-436 808 Div. 27, 10
OTS price $11.00

Pratt and Whitney Aircraft, West Palm Beach, Fla.
STUDY OF TURBOJET MAIN BURNERS FOR USE WITH CONTAMINATED FUEL.
Monthly progress rept. no. 8, 1-31 Jan 64, by Stanley A. Mosier. 10 Feb 64, 147p. Rept. no. FR896
Contract NOw63 0489d
Unclassified report

Descriptors: (*Turbojet engines, Combustion chambers), (*Combustion chambers, Fuel injectors), Fuel contamination, Design, Manufacturing methods, Temperature, Vaporization, Jet engine fuels, Air, Heat transfer, Surface temperature, Jet engine fuels, Captive tests, Boiling, Combustion.

Thirty-six tests totaling 40 hours were made with the first rig build of the vaporizing center tube burner can. After this period, the burner can was in perfect condition. The burner can was operated over a range of values for inlet air mean total temperature (TT3) from 528 to 1244 F and values of delta T rise from 355 to 1827 F at values of inlet air mean total pressure (PT3) from 40.6 to 52.1 in. HgA. Values of combustion efficiency and combustion system total pressure loss ranges from 75.3 to 101.5% and from 6.19 to 12.10%, respectively. Fourteen tests were made with PWA-523 fuel using one PWA-1060 (Inconel) and two Inconel-X tube test sections. A tube burnout occurred with the PWA-1060 material tube section when, during a power supply checkout, the power level caused the maximum allowable tube wall temperature to be exceeded momentarily. During the 13 tests with the Inconel-X test section, both non-boiling and boiling regime excursions were made. (Author)

AD-437 523 Div. 27
OTS price $1.60

British Internal Combustion Engine Research Association.
INVESTIGATION OF THE EFFECT OF COMPRESSION TEMPERATURE ON COMBUSTION IN A DIESEL ENGINE USING AN ATKINSON CYCLE. PART I. TESTS ON A TANGYE VCP1 ENGINE,
by D. W. Tryhorn. 27 Nov 63, 18p. Rept. no. VR4174
Contract DA91 591EUC1540
Unclassified report

Descriptors: (*Diesel engines, Temperatures), Tests, Compressive properties, Combustion, Thermodynamics, Intake valves, Timing devices, Great Britain, Temperature, Pressure, Fuel consumption, Valves, Ignition lag, Thermodynamic cycles, High pressure research.

A Tangye VCP1 engine was tested under high pressure, variable temperature charge conditions using both early and late inlet valve closing points to reduce the effective compression ratio. It was thus possible to obtain performance data over a range of compression temperatures lower than is feasible with a normal cycle. The results serve to show the effect of compression temperature on an engine with a high swirl, single-hole nozzle, combustion system. The theoretical gains expected from use of the 'modified Atkinson cycle' were, however, not substantiated by the results. This was traced to the excessive values of the charge heating effects associated with the throttling losses which inevitably result from closing the inlet valve while the piston is in mid-stroke. The consequence was that the compression temperature was never low enough to have a really marked effect on combustion but, at the lowest temperature reached, there was some deterioration in performance attributable to an over-cool charge. (Author)

AD-437 665 Div. 27
OTS price $1.10

Curtiss-Wright Corp., Woodridge, N. J.
DESIGN, DEVELOPMENT, AND FABRICATION OF ULTRA-HIGH STRENGTH SOLID PROPELLANT ROCKET MOTOR CASES.
Quarterly progress rept. no. 2, 20 Aug-20 Nov 63, by Carmine J. Bua. 17 Jan 64, 7p.
Contract AF04 611 9064
Unclassified report

Descriptors: (*Rocket cases, Design), (*Rocket motors (Solid propellant), Rocket cases), Forging, Management planning, Scheduling, Production, Heat treatment, Hydrostatic pressure, Processing, Welding, Filament wound construction, Manufacturing methods.

The late delivery of critical raw material has affected the schedule dates for the hydroburst tests and shipment of the final two cases. The initial centerbody sections have been successfully shear spun. The welding of the case subassemblies has also been highly successful. The heat treatment study for the rocket motor case will begin now that material for this study is available. At this point in time approximately twenty-five percent (25%) of the program efforts have been completed. (Author)

AD-437 884 Div. 27, 30
OTS price $1.60

Naval Air Test Center, Patuxent River, Md.
EVALUATION OF ENGINE PERFORMANCE ANALYSIS EQUIPMENT.
Interim rept. no. 2.
24 Apr 64, 11p.
Task RA1200001
NATC ST32 46R64 Unclassified report

Descriptors: (*Turbojet engines, Temperature), Guide vanes, Recording systems, Malfunctions, Reliability, Performance (Engineering), Acceptability, Computers, Programming (Computers), Measurement, Instrumentation.

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-435 150 Div. 28
OTS price $2.60

Educational Testing Service, Princeton, N. J.
RIGOROUSLY AND NONRIGOROUSLY PARALLEL TEST FORMS, by Frederic M. Lord. Feb 64, 21p. Rept. no. RB64 14
Contract Nonr275200, Proj. NR151 201
Unclassified report

Descriptors: (*Test construction (Psychology). Theory), Errors, Measurement, Statistical analysis, Standards.

When several test forms are used interchangeably, they will not in practice, despite all efforts, be rigorously parallel. A definition of the standard error of measurement appropriate for this type oe situation can be provided; however, it must be different from the definition in classical test theory. Appropriate formulas for the standard error of measurement and for other related quantities under both definitions are derived and compared; also sample statistics for estimating these quantities. (Author)

AD-435 442 Div. 28, 30
OTS price $1.10

Vermont U., Burlington.
THE EFFECT OF INFORMATION LOAD ON THE RECOGNITION OF ALPHA-NUMERIC STIMULI,
by Madge M. Grace and Bennet B. Murdock, Jr.
1 May 62, 6p.
Contract Nonr321902X
Unclassified report

Descriptors: (*Pattern recognition, Acuity), (*Vocabulary, Coding), (*Reasoning, Pattern recognition), Decision making, Analysis of variance, Probability, Stimulation.

The prupose of the present experiment was to determine the effect of the amount of information on the recognition of alpa-numeric stimuli. The stimuli used in the present experiment were digita, consonants, rare and common words. In general words were more accurately recognized than either digits or consonants. For digits and consonants, there appeared to be a positive relationship between the amount of information and the accuracy of recognition; that is, to some extent those stimuli conveying less information. These results suggest that, with alpha-numeric coding, the information load can be increased without imparing the accuracy of recognition. (Author)

AD-435 444 Div. 28
OTS price $1.10

Vermont U., Burlington.
THE EFFECT OF FACTOR LOADING ON THE RECOGNITION OF COMPLEX STIMULI.
by Frank Warhurst and Bennet B. Murdock, Jr. 1 May 62, 6p.
Contract Nonr321902X
Unclassified report

Descriptors: (*Pattern recognition, Acuity). Coding, Colors, Stimulation, Display systems, Probability, Errors, Reasoning.

With multi-dimensional stimuli the amount of information conveyed by each divension can vary. The purpose of the present experiment was to study such variation while holding the total information load per stimulus constant. Colored, cross-hatched forms were used in a recognition task, and the amount of information conveyed by each dimension (i.e., color, form, and crosshatching) was varied from one to four bits. The total information load was always seven bits. Accuracy of recognition was completely unaffected by factor loading; therefore, within the limits of this experiment, factor loading does not appear to be a critical variable in recognition accuracy. (Author)

AD-435 502 Div. 28, 16
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
STRESS AND FATIGUE UNDER ISOLATED CONDITIONS,
by F. D. Gorbov, V. I. Myasnikov and B. I. Yazdovskiy. 18 Mar 64, 14p.
FTD TT63 1015 Unclassified report

Trans. from Zhurnal Vysshey Nervnoy Deyatel'nosti, 8:4, pp. 585-592, 1963.

Descriptors: (*Stress (Psychology), Confined environments), (*Fatigue (Physiology), Confined environments), Behavior, Motor reactions, Emotions, Excretion, Adjustment (Psychology), Verbal behavior, Reaction (Psychology), Tolerances (Physiology), Stress (Physiology).

AD-435 544 Div. 28, 16
OTS price $0.75

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
THE EFFECTS OF TRANSIENT WEIGHTLESSNESS ON BRIGHTNESS DISCRIMINATION.
Rept. for Apr-Aug 63,
by William J. White. Mar 64, 17p. Rept. no. VH8137E
Contract AF33 657 11600, Projs. 7183, 7184
Tasks 718302, 718405
AMRL TDR64 12 Unclassified report

Report on Psychological Research on Human Performance.

Descriptors: (*Visual perception, Brightness), (*Weightlessness, Visual perception), Thresholds (Physiology), Reaction (Psychology), Measurement, Adjustment (Psychology), Analysis of variance, Acceleration, Stress (Physiology).

Contrast thresholds of six semisupine, visually adapted subjects were obtained under short (10-15 sec.) periods of weightlessness and under 1-G control conditions. The target, viewed binocularly, subtended 1.5 and the background 2.6. Three background luminance levels were used: 0.03, 0.28 and 30.0 ft-L. The contrast required to detect the target was found to be slightly, but consistently, lower under the weightless condition than under the control, 1-G, condition. Under the weightless condition the contrast required to detect the target averaged 12.56% at 0.03 ft-L background luminance, 6.4% at 0.28 ft-L background luminance and 3.99% at 30.0 ft-L background luminance. The corresponding contrasts required under the control, 1-G, condition averaged 15.14%, 7.05% and 4.45% respectively. (Author)

AD-435 569 Div. 28
OTS price $4.60

Illinois Univ., Urbana.
A SOCIAL PSYCHOLOGICAL APPROACH TO THE STUDY OF NEGOTIATION,
by Joseph E. McGrath. Apr 64, 50p. TR1
Contract AF49 638 1291
Unclassified report

Descriptors: (*Social psychology, Decision making), (*Group dynamics, Applied psychology), Social communication.

AD-435 572 Div. 28
OTS price $1.60

Psychological Lab., Johns Hopkins Univ., Baltimore, Md.
A REPORT OF RESEARCH UNDER CONTRACT WITH OFFICE OF NAVAL RESEARCH.
Final rept. 1 Nov 58-15 June 63,
by Alphonse Chapanis. 15 June 63, 11p.
Contract Nonr248 55
Unclassified report

Descriptors: (*Sensory mechanism, Perception), (*Human engineering, Computers), Vision, Communication theory, Errors, Theory, Modles (Simulation), Engineering, Psychology.

AD-435 686 Div. 28
OTS price $3.00

Bolt Beranek and Newman, Inc., Cambridge, Mass.
FURTHER STUDIES OF MULTIPLE REGRESSION ANALYSIS OF HUMAN PILOT DYNAMIC RESPONSE: A COMPARISON OF ANALYSIS TECHNIQUES AND EVALUATION OF TIME-VARYING MEASUREMENTS.
Rept. for Mar 62-June 63,
by Jerome I. Elkind. Mar 64, 168p. Rept. no. 1069
Contract AF33 657 8224, Proj. 8219, Task 821905
ASD TDR63 618 Unclassified report

Descriptors: (*Pilots, Mathematical models), (*Motor reactions, Flight control systems), Performance (Human), Mathematical analysis, Time studies, Differential equations, Correlation techniques, Linear systems, Psychomotor tests, Reflexes.

Multiple regression analysis is used for comparing four system identification techniques commonly used to determine human pilot describing functions: cross-correlation analysis, cross-power density spectrum analysis, orthogonalized exponential function analysis, and differential equation coefficient methods. Relations for the expected values and variances of the measurements obtained using these methods are derived. The relative advantages of these methods for long and short sample measurements are dicussed. A method is presented for computing estimates of the coefficients of the differential equation for the human pilot from the regression coefficients obtained for the orthogonalized exponential analysis method. Differences in describing function estimates obtained from direct open-loop measurements in which the error signal is used as the input for analysis and estimates obtained from closed-loop measurements in which the system input signal is used as the input are also discussed. (Author)

AD-436 015 Div. 28, 26, 5, 13
OTS price $.50

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson AFB, Ohio.
REMOTE VIEWING: A COMPARISON OF DIRECT VIEWING, 2D AND 3D TELEVISION.
Rept. for June-July 63,
by William N. Kama and Roger C. DuMars. Feb 64, 9p.
Proj. 7184, Task 718407
AMRL TDR64 15 Unclassified report

Report on Human Performance in Advanced Systems.

Descriptors: (*Human engineering, Positioning devices (Machinery)), Television display systems, Performance tests, Remote control systems, Stereoscopic display systems, Visual perception, Time, Tables, Operators (Personnel).

The effect of three viewing conditions -- direct, 2D television, and 3D television -- upon performance of a simple remote handling task was investigated. Fifteen subjects used a CRL Model

8 master-slave manipulator to perform a shortened and revised version of the Placing Subtest of the Minnesota Rate of Manipulation Test. All subjects performed the task under each of the viewing conditions employed. Results of this study indicated that: (1) subject performance under the direct viewing condition was significantly faster than that obtained under either of the video conditions, and (2) no significant differences were noted between the two video conditions even though performance times under the 2D condition were initially longer than those obtained under the 3D condition. (Author)

AD-436 103 Div. 28
OTS price $3.60

New York State Univ., Buffalo.
THE EFFECT OF INFORMATION ABOUT STRATEGY ON A THREE-PERSON GAME,
by W. Edgar Vinacke, Doris C. Crowell, Dora Shu-Fang Dien and Vera Young. 2 Apr 64, 35p.
Rept. no. TR6
Contract Nonr437400
Unclassified report

Descriptors: (*Group dynamics, Test methods), Motivation, Game theory, Reasoning, Sex.

An experiment was conducted to determine whether information about alternative strategies in a competitive game would result in a shift from outcomes determined by perception of strength to outcomes in line with strictly rational analysis of power conditions. It ran triads first through an extended learning session, followed by an identical information session. In one set of triads, one member was provided with information about both strategies; in a second, two members were informed; and in a third, all three members were informed. Conditions were similar to those employed previously. Results are: sex differences occurred, with males displaying a predominantly exploitative strategy and females a typically accommodative strategy. In the critical power-patterns, when two players were weaker than the third, there was little evidence for a significant shift to an equal incidence of the three possible coalitions. Bargaining increased in the information session, but reached significance only for the female triads under two of the information conditions. There was no evidence that the specially informed players differed from the uninformed players in their ability to enter into coalitions. There is evidence that the chief effect of the information conditions was to increase motivation to win.

AD-436 180 Div. 28
OTS price $5.60

Massachusetts Mental Health Center, Boston.
AN ANALYSIS OF THE EFFECTS OF MOTION UPON AUDITORY FUNCTION DURING PROLONGED ATYPICAL STIMULATION,
by Sanford J. Freedman and Steven K. Secunda.
Apr 62, 54p.
Grant AF AFOSR62 11
AFOSR 2078 Unclassified report

Presented at the Eastern Psychological Association Meeting, Apr 62, at Atlantic City, N. J.

Descriptors: (*Auditory perception, Time), Motion, Thresholds (Physiology), Rotation, Psychomotor tests, Sensor mechanisms.

The present experiment attempts to ascertain which components of gross bodily movement are responsible for the increased variability in dichotic time difference discrimination. Four one-hour exposure conditions were employed during which the subjects heard continuous white noise loud enough to mask background sounds. The conditions were: (1) ambulatory, (2) recombent, (3) active head rotation and (4) active whole body rotation. After exposure in the ambulatory condition subjects showed significantly increased variability in the criterion task. Performance also deteriorated significantly with active head rotation and active whole body rotation. When bodily movements were restricted, however, there was essentially no increased variability. Thus, self-produced rotation while listening to dichotic noise is sufficient to disrupt a fundamental cue for auditory localization. (Author)

AD-436 402 Div. 28
OTS price $3.60

Utah Univ., Salt Lake City.
VARIABLES RELATED TO ACCURACY IN INTERPERSONAL PERCEPTION.
Final rept.,
by Victor B. Cline and James M. Richards, Jr.
Jan 64, 31p.
Contract Nonr128804
Unclassified report

Descriptors: (*Group dynamics, Behavior), (*Perception (Psychology), Group dynamics), Psychometrics, Motivation, Social psychology, Test methods, Statistical analysis, Analysis of variance.

AD-436 453 Div. 28
OTS price $7.60

University Southern California, Los Angeles.
THE PSYCHOLOGICAL DIMENSIONALITY OF BASIC ELECTRONIC CIRCUITS: II. INTERPRETATION OF THE STATISTICAL DIMENSIONS,
by Joseph W. Rigney. Mar 64, 74p. Rept. no. TR39
Contract NONR22822, Proj. NR153 093
Unclassified report

Descriptors: (*Electronic technicians, Psychometrics), (*Psychometrics, Electronic technicians), Applied psychology, Electronic equipment, Circuits, Training, Factor analysis, Statistical analysis, Maintenance personnel.

This is the second of a series of reports presenting the results of applying multidimensional scaling techniques to the analysis of the conceptual difficulty associated with basic electronic circuits. Two multidimensional scaling techniques were applied to thirteen basic electronic circuits. One technique was the standard technique, in which Ss judged the proximity of the circuits with one another; the second was a new technique, in which the proximity judgments were restricted to a conceptual difficulty referent. The dimensional structures of these two sets of data were analyzed and compared. The comparison showed that the two techniques yielded different dimensional structures. (Author)

AD-436 465 Div. 28, 32
OTS price $8.60

Human Engineering Labs., Aberdeen Proving Ground, Md.
MILESTONES. A DIRECTORY OF HUMAN ENGINEERING LABORATORIES PUBLICATIONS, 1953-1963,
by Donna M. Warren. Dec 63, 94p.
Unclassified report

Supersedes 1962 edition.

Descriptors: (*Human engineering, Bibliographies), (*Bibliographies, Human engineering),

(*Indexes, Human engineering), Sensory perception, Perception (Psychology), Performance (Human), Motor reactions, Environmental tests, Military psychology.

Milestones is a cross-referenced directory of reports that the U. S. Army Human Engineering Laboratories have published since their founding in 1953. It will be compiled and re-issued each year to provide an up-to-date index for the convenience of other people and organizations working in the human factors engineering field. (Author)

AD-436 571 Div. 28
OTS price $7.60

Texas Christian U., Fort Worth.
PREDICTION OF AIR FORCE ADAPTABILITY OF BASIC AIRMEN REFERRED FOR MENTAL HYGIENE CLINIC EVALUATION.
Final technical rept.,
by S. B. Sells and Douglas J. Mace. 30 Jun 63, 74p.
Contract AF41 657 411
Unclassified report

Descriptors: (*Mental disorders, Analysis), (*Adaptability (Physiology), Mathematical prediction), (*Aviation personnel, Adaptability, (Physiology)), Training, Recruiting, Experimental data, Personnel, Psychiatry, Diagnosis, Tables, Coding.

AD-436 596 Div. 28, 32
OTS price $2.60

Stanford Univ., Calif.
PERCEPTION OF LEADERSHIP IN SMALL GROUPS. RELIABILITY AND INTERCORRELATIONS FOR THIRTEEN LEADERSHIP CRITERIA,
by Thomas W. Harrell, Lucy E. Burnham, Ruth S. Hunt and Hans E. Lee. Apr 64, 24p. Rept. no. TR8
Contract Nonr22562, Proj. NR171 388
Unclassified report

Descriptors: (*Leadership, Perception), Group dynamics, Behavior, Sociometrics, Reaction (Psychology), Personality.

AD-436 872 Div. 28, 23, 31
OTS price $11.00

Applied Psychological Services, Wayne, Pa.
DIGITAL SIMULATION OF SUBMARINE CREW PERFORMANCE. I. LOGIC OF A PSYCHOSOCIAL MODEL FOR DIGITALLY SIMULATING CREW PERFORMANCE,
by Arthur I. Siegel, J. Jay Wolf, J. David Barcik and William Miehle. Apr 64, 142p.
Contract Nonr402100FBM
Unclassified report

Descriptors: (*Performance tests, Simulation), (*Submarine personnel, Performance tests), Group dynamics, Digital computers, Applied psychology, Military psychology, Mathematical prediction, Computer logic, Theory, Military personnel, Data, Models (Simulations).

The psychological concepts of group theory are organized and presented as they apply to the military situation in which crews operate in confined quarters for extended time intervals. Based upon selected aspects of this body of concepts, a logic is developed for digitally simulating crew performance in a closed man-machine system. Thus, a model is formulated and described which has as its primary aim the prediction of system effectiveness using primarily psychosocial variables. The data required as input to the model, including general mission, equipment, and personnel information, are described. The computational techniques are formulated for a digital computer in accordance with the psychologic and are based on expected military, social, and environmental conditions. The simulation involves the prediction of performance for individualized 'men,' selected appropriately from the crew to form teams which accomplish each specific task of the mission. Results expected to be available from the model, including measures of system effectiveness, personnel loading, and personnel data, are described. (Author)

AD-437 304 Div. 28
OTS price $2.60

Educational Testing Service, Princeton, N. J.
EXPERIENCE AS AN 'INSTRUCTIONAL SET' IN NEGOTIATION.
Final technical rept. and research bulletin,
by Albert E. Myers and Frederick R. Kling.
Mar 64, 23p. Rept. no. RB64 17
Contract Nonr305400
Unclassified report

Descriptors: (*Test construction, Experimental data), (*Behavior, Social communication), Theory, Analysis of variance, Measurement, Costs, Wages, Decision making, Game theory.

AD-437 334 Div. 28, 16
OTS price $2.60

Human Factors Research, Inc., Los Angeles, Calif.
THE EFFECT ON THE LEVEL OF VIGILANCE OF AN ADJACENT SECONDARY VIGILANCE TASK,
by J. 'O'Hanlon, Jr. and E. A. Schmidt. Apr 64, 27p. Rept. no. TR750 4
Contract Nonr 412000, Proj. NR196 035
Unclassified report

Descriptors: (*Visual perception, Performance tests), (*Attention, Job analysis), Visual signals, Errors, Acuity, Display systems, Experimental data, Tables.

The purpose of this study was to determine whether performance of a main visual vigilance task could be enhanced by presenting observers with knowledge concerning their performance of an adjacent and concurrent secondary visual vigilance task. Observers were instructed that adequate or inadequate performance of the secondary task, as given by a form of knowledge of results, connoted the adequacy of their performance of the main task. It was concluded that performance of a main visual vigilance task is impaired by the presence of an adjacent visual vigilance display on which occasional 'secondary' signals are presented. This is true regardless of whether instructions indicate that secondary signals are to be responded to (with knowledge of results to signals on the main task), or ignored. (Author)

AD-437 349 Div. 28
OTS price $5.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
MULTIDIMENSIONAL ANALYSIS OF VISUAL FORM.
Final rept., 22 Aug 62-15 Jun 63,
by Carl A. Silver and Samuel Messick. 15 Jun 63, 58p. Rept. no. F B2002
Unclassified report

Subcontract to Honeywell Inc., Minneapolis, Minn.

Descriptors: (*Perception (Psychology), Pattern recognition), (*Pattern recognition, Perception (Psychology)), Students, Females, Stimulation, Radar images, Photographic images, Visual perception.

Multidimensional analytic methods were used to investigate some of the factors underlying from perception. Stimuli used in this study were black forms on a white background. The stimuli were 'nonsense' forms generated by choosing points in a matrix randomly and connecting the points according to arbitrary rules. Subjects were two groups of twenty-five female students. The method of multidimensional successive intervals was used. Subjects assigned pairs of stimuli to sixteen categories based upon the degree of similarity between the members of each pair. Data for each group of twenty-five subjects were reduced separately yielding, for each group of subjects, five points-of-view and seven stimulus dimensions. Correlation between similarity judgments between the two subject groups was high and the interpretation of the stimulus dimensions for the two groups was very similar. Consequently, the two groups were combined for further analysis. It was found possible to state verbal descriptions of the seven stimulus dimensions; however, quantitative descriptions were not developed because of the limited scope of study. (Author)

AD-437 588 Div. 28
OTS price $11.00

Human Sciences Research, Inc., McLean, Va.
INFORMATION-PROCESSING TASKS IN TACTICAL ACTION SELECTION: PERFORMANCE OF EXPERIENCED SUBMARINE OFFICERS IN WEIGHTING MULTIPLE CRITERIA FOR DEPTH SELECTION.
Final rept. for Jan 62-Mar 64,
by W. S. Vaughan, Jr., T. R. Virnelson and R. D. Franklin. Mar 64, 150p. Rept. no. RR63 26Ae
Contract Nonr367100
Unclassified report

Descriptors: (*Data processing systems, Job analysis), (*Submarine personnel, Officer personnel), Human engineering, Selection, Performance tests.

The problem of how to allocate tasks between men and equipment components of a command and control system is addressed. Specific information-processing steps involved in the selection of a course of action from among alternatives are defined as the tasks to be allocated in a man/computer partnership. Performance data reflecting the ability of experienced tactical commanders to perform each of these five information-processing tasks singly and in combination are required as a part of the data base for allocation decision. The results indicate that although individual commanders differ from one another in the importance they attach to a set of depth selection critera, any one officer is highly consistent of his judgments of importance and these judgments are stable over time and sensitive to differences in the tactical situation. (Author)

AD-437 589 Div. 28
OTS price $6.60

Rand Corp., Santa Monica, Calif.
COMPUTERS AND COMPREHENSION,
by M. Kochen, D. M. MacKay, M. E. Maron, M. Scriven and L. Uhr. Apr 64, 70p. Memo no. RM4065 PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Reasoning, Language), (*Language, Communication theory), Models (Simulation), Learning, Motivation, Computers, Theory.

AD-437 635 Div. 28
OTS price $3.60

Washington U., St. Louis, Mo.
HOPE OF SUCCESS, FEAR OF FAILURE, SUBJECTIVE PROBABILITY, AND RISK-TAKING BEHAVIOR,
by Richard deCharms and Prafulachandra N. Dave. 17 Apr 64, 37p. Rept. no. TR21
Contract Nonr816 11, Proj. NR170 424
Unclassified report

Descriptors: (*Motivation, Behavior), Fear, Probability, Achievement tests.

AD-437 810 Div. 28
OTS price $1.60

Indiana Univ., Bloomington.
ELECTROPHYSIOLOGICAL EFFECTS OF SHORT-TERM SENSORY DEPRIVATION,
by Robert M. Stern. Nov 63, 17p. Technical rept. no. 9
Contract Nonr908 15
Unclassified report

Descriptors: (*Sensory deprivation, Behavior), Measurement, Nervous system, Muscles, Musculoskeletal system, Autonomic nervous system.

It was the purpose of this study to investigate the effects of two different sensory deprivation situations for period of one hour. The effects were measured in terms of the electrophysiological activity of the autonomic nervous system and the skeletal muscle system. A Vigil Group reported the movements of an autokinetic light; a Rest Group simply relaxed. The autonomic indices revealed significantly higher somatic activity for the Vigil Group, thus supporting Malmo's hypothesis concerning the importance of task demands in determing level of physiological activity. (Author)

AD-437 811 Div. 28
OTS price $1.10

Indiana Univ., Bloomington.
LONG-TERM OBSERVATION OF THE AUTOKINETIC ILLUSION: FREQUENCY AND DIRECTION OF MOVEMENT,
by Robert M. Stern. Jan 64, 9p. Technical rept. no. 10
Contract Nonr908 15
Unclassified report

Descriptors: (*Illusions, Performance tests), Motion, Theory, Sensory deprivation, Fatigue, Attention.

This study was designed to test the following hypotheses: (a) reports of autokinetic movement increase with increasing exposure time; (b) reports of movement in the vertical plane occur with greater frequency than reports of movement in the horizontal plane. Forty subjects, who were told that they were radar watchkeepers, observed a pin point of light in a dark room for 30 min. and indicated the direction of apparent movement. The results obtained supported both hypotheses. The increase in reports of movement is accounted for in terms of in-

creased suggestibility due to the effects of sensory deprivation. A possible explanation for the greater frequency of reports of vertical movement is discussed in terms of Kummapas' theory of the relevance of the horizontally-extended oval shape of the visual field for the horizontal-veritcal illusion. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-435 997 Div. 29
OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SPACESUITS,
by Yu. Savitskiy. 26 March 64, 13p.
FTD TT64 134 Unclassified report

Trans. from Nauka I Zhizn', Izdatel'stovo Pravda, No. 12, pp. 40-44, 1963.

Descriptors: (*Flight clothing, Design), Space flight, Effectiveness, Protective clothing, Respiration, Decompression, Life support.

AD-437 175 Div. 29
OTS price $3.60

Coast Guard, Washington, D.C.
ADDITIONAL TESTS TO DETERMINE EFFECT OF GASOLINE AND OIL ON APPROVED KAPOK LIFE PRESERVERS.
18 Nov 59, 32p.
Proj. CGTD J28 3 3 1 2e
CG 202 Unclassified report

Descriptors: (*Life preservers, Degradation), Gasoline, Kerosene, Buoyancy, Films, Sea water.

Previous tests have shown that there is a serious loss in buoyancy of kapok life preservers (without PVC envelopes) when subjected to agitation in water with a thin film of gasoline or kerosene. These past projects were carried out using fresh water and the performance tests were done by immersing life preservers in a gasoline or kerosene film for a continuous period of 12 hours. In carrying out tests in this project, salt water was used for control test purposes. In addition, data was collected for loss of buoyancy when immersed in an oil film for thirty to sixty minutes and then removed from the oil film and immersed in salt water for a total of 12 hours. All the immersions were done with agitation. In order to round out the available data on the effects of gasoline and oil, sixty used life preservers of known vintage and history were subjected to tests. The specimens were divided into two groups for tests: one group five years old or over, and another group under five years old. The results of tests in this project do not follow the same trend as past tests. However, it showed that about 90% of the older preservers and about 50% of the newer preservers will fail in less than 12 hours when agitated in sea water (with or without gasoline and fuel oil films). Jackets with the same history showed large differences in performance. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-435 108 Div. 30
OTS price $4.60

Mitre Corp., Bedford, Mass.
AN INPUT/OUTPUT TYPEWRITER FOR COMMUNICATING WITH A DIGITAL COMPUTER,
by J. Mitchell. Mar 64, 44p. Rept. no. TM3838
Contract AF19 628 2390, Proj. 508
ESD TDR64 81 Unclassified report

Descriptors: (*Digital computers, Typewriters), (*Typewriters, Digital computers), Input-output devices, Design, Data storage systems, Instruction manuel, Circuits.

An input/output typewriter provides the typist with means of entering data into a computer program through the keyboard and a means of obtaining data from the computer through the printer. An input/output typewriter, which is a modification of a standard Selectric typewriter, has been designed for use with the Phoenix computer through the low-speed buffer or with The MITRE 7030 computer through the System Design Laboratory (SDL) display consoles.

AD-435 112 Div. 30, 9
OTS price $7.60

Douglas Aircraft Co., Inc., Long Beach, Calif.
ANALYTIC DESIGN OF IMPROVED STATIC PRESSURE SENSING PROBES FOR ALL MACH NUMBERS,
by John L. Hess, A. M. O. Smith and Thomas L. Rivell. 14 Feb 64, 77p. Rept. no. LB31589
Contract NOw62 0297t, Task Order 62 7
Unclassified report

Descriptors: (*Pressure gages, Supersonic flow), Airborne, Aircraft, Guided missiles, Design, Subsonic flow, Orifices, Stagnation point, Aerodynamic configurations, Aerostatics.

A systematic analytic method is described for designing a static pressure sensing system for an aircraft or a missile. The system relies on a boom-type static pressure probe that senses free-stream static pressure independently of Mach number, Reynolds number, and flow inclination. Independence of Mach number is obtained by properly shaping the external contour of the probe. Reynolds number effects are eliminated by the use of a forward orifice location. The sensed pressure is rendered insensitive to flow inclination by distributing pressure orifices around the circumference of the probe. This report is a complete summary of the design method and is intended for use as a design manual for this type of static pressure sensing system. (Author)

AD-435 443 Div. 30, 23
OTS price $1.10

Vermont U., Burlington.
SEARCH TIME FOR ALPHA-NUMERIC STIMULI.
by Madge M. Grace, Frank Warhurst and Bennet B. Murdock, Jr. 1 Aug 62, 9p.
Contract Nonr321902X
Unclassified report

Descriptors: (*Pattern recognition, Acuity), (*Perception, Threshold (Physiology), Information retrieval, Time, Errors, Coding, Stimulation.

Five experiments were conducted to study the recognition of alpha-numeric stimuli. The stimuli were 2-6 consonant or digit combinations which varied in length (i.e., number of consonants or digits per stimulus) and uncertainty (number of alternatives from which the consonants or digits were selected). There were two different tasks; in one task S had to find the one pair of identical stimuli in a square matrix, while in the other task S had to find one particular stimulus in a square matrix. In general search time increased with the total amount of information conveyed by the stimulus, but message length seemed to be a more important variable than uncertainty. It was suggested that, with alpha-numeric coding, the most rapid performance would probably occur with minimum length and maximum uncertainty.

AD-435 465 Div. 30
OTS price $4.60

Houston Fearless Corp., Los Angeles, Calif.
AUTOMATIC UNIT-RECORD STORAGE AND RETRIEVAL DEVICE BS-6A.
Final technical rept.
by S. Spengler and L. Maisner. 3 Apr 64, 45p.
Rept. no. R113 64
Contract AF30 602 2553, Proj. 4594, Task 459402
RADC TDR63 503 Unclassified report

Descriptors: (*Information retrieval, Computers), Data processing systems, Data storage systems, Computer logic, Design, Test sets.

Project SCRAM's prime program objective is to establish economical methods of storing 10,000 unit records and retrieving them at a minimum rate of 150 per second per module. Hydraulic and pneumatic methods of unit-record transport proved operationally unreliable and difficult to implement during subsequent breadboarding, so they were abandoned. More reliable and economical electromechanical hardware was developed. Logic subsystem design, special memory-control circuit design, design of commercial logic cards, and the drum memory design are discussed in this report. (Author)

AD-435 484 Div. 30
OTS price $4.60

RAND Corp., Santa Monica, Calif.
ON CYBERNETICS, INFORMATION PROCESSING, AND THINKING,
by M. E. Maron. Mar 64, 42p. Rept. no. P 2879
Unclassified report

Descriptors: (*Artificial intelligence, Design). Data processing systems, Reasoning, Cybernetics, Language, Computer logic, Analysis, Measurement, Learning, Theory.

The purpose of this paper was to examine the origins, development, and present status of those key cybernetic notions that provide an information-flow framework within which to attack one aspect of the question of how a person thinks; i.e., the question of the information mechanisms and processes which underlie and are correlated with thinking. The cybernetic way of looking at information processing in the nervous system is examined to see in what sense it provides new and sharp tools of analysis for the neurophysiologist. With this as background, the problem of artificial intelligence is considered and with that the logical and linguistic difficulties in talking about the relationship between thinking and brain activity. An information-flow model of an artificial brain mechanism is described whose activity, it is argued, is the correlate to activity such as perceiving, learning, thinking, knowing, etc. This leads to a consideration of the impact of these notions on theoretical neurophysiology

and its attempt to frame suitable hypotheses, and on epistemology concerned with the logical analysis of measures, methods, and techniques which can justify the activity of knowing. (Author)

AD-435 508 Div. 30
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COAXIAL DOUBLE-SLOTTED MEASURING LINE.
28 Feb 64, 4p.
FTD TT64 6 Unclassified report

Trans. from Komitet Standartov, Mer I Izmeritel'-nykh Priborov Pri Sovete Ministrov SSSR, 1962.

Descriptors: (*Measuring devices (Electrical & electronic), Coaxial cables), (*Coaxial cables, Measuring devices (Electrical and electronic), Standing wave ratios, USSR, Electrical impedance, Electric potential, Probes (Electromagnetic), Resonators.

The coaxial double-slotted measuring line is intended for the measurement of a voltage standing wave ratio (VSWR) and the impedances of coaxial loads. It consists of a section of coaxial line with two longitudinal slots in the external conductor and which are symmetrically located relative to the axis of the conductor in the diametric plane. A probe is lead into each slot. Both probes, symmetrically located relative to the internal conductor of the coaxial, excite one coaxial resonator which is coaxially located with the basic coaxial and moves along its surface as on a guide. (Author)

AD-435 514 Div. 30, 9, 12, 1
OTS price $13.50

Office of the Director of Defense Research and Engineering, Washington, D.C.
SHOCK, VIBRATION AND ASSOCIATED ENVIRONMENTS. PART III.
Mar 64, 294p.
ODDRE B33 Unclassified report

The 33rd Symposium on Shock, Vibration and Associated Environments was held 3-5 Dec 1963 in Washington, D.C.

Descriptors: (*Symposia, Vibration), (*Symposia, Shock (Mechanics)), (*Vibration, Symposia), (*Shock (Mechanics), Symposia), Environmental tests, Test methods, Test equipment, Measurement, Calibration, Instrumentation, Impact shock, High temperature research, Aircraft, Spacecraft, Manned spacecraft, Structures, Airframes, Electronic equipment, Guided missiles (Air-to-surface), Acoustics, Models, (Simulation), Model lists.

AD-435 524 Div. 30
OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 7. ENGINEERING.
Quarterly progress rept., 1 Dec 63-29 Feb 64.
15 Mar 64, 26p.
Contract AF19 628 500
ESD TDR64 39 Unclassified report

Descriptors: (*Engineering, Scientific research), Mechanical engineering, Civil engineering, Cryogenics, Antennas, Telescopes, Reentry vehicles, Optical equipment, Space communication systems, Communication satellites (Active), Radar, Manned spacecraft, Radomes, Radar antennas, Control systems.

Contents: Mechanical Engineering-Group 71, I. General, II. Laboratory services, III. General research, IV. Re-entry physics, V. PRESS program, VI. Space communications, VII. Radar discrimination technology, VIII. Apollo; Construction Engineering-Group 75; I. General, II. Radome heating system-Millstone communications site, III. Antenna access - AMRAD radar, White Sands; and Control Systems - Group 76; I. Objectives, II. Millstone radar, III. Project west ford, IV. AMRAD, V. Apollo, VI. Haystack hill experimental facility.

AD-435 557 Div. 30
OTS price $17.50

Auerbach Corp., Philadelphia, Pa.
QUANTITATIVE METHODS FOR INFORMATION PROCESSING SYSTEMS EVALUATION.
Final rept. Mar 63-Jan 64,
by Alan Taylor, John R. Hillegass and Norman Statland. Jan 64, 278p.
Contract AF19 628 2838, Proj. 1134
ESD TDR64 194 Unclassified report

Descriptors: (*Data processing systems, Feasibility studies), (*Information retrieval, Digital computers), Test sets, Design, Models (Simulations), Programming (Computers), Language, Machine translation, Documentation, Data transmission systems, Data storage systems.

The VECTOR process is a new procedure for producing quantitative, objective estimates of the performance of digital computer systems. The essence of the VECTOR process is the production of descriptions, in standardized formats, of the characteristics of each problem to be solved and each computer system to be considered. Furthermore, the method provides a series of synthetic measures of application unknowns, which when adapted to the variations in each computer system design enable the subjective considerations of system evaluations to be removed. Then, by means of straightforward calculations, the estimated processing time for a specific application on a specific computer configuration can readily be produced through a standard procedure. (Author)

AD-435 611 Div. 30
OTS price $3.60

Air Force Proving Ground Command, Eglin AFB, Fla.
DEVELOPMENT TEST OF THE AN/DSQ-5 SCORING SET (FORMERLY A/A24D-5(XI-3) SCORING SYSTEM).
by Russell A. Bunn and Paul E. Barnett. Mar 64, 40p.
Proj. 7841W23
APGC TDR64 17 Unclassified report

Descriptors: (*Telemetering transmitters, Firing errors indicators), Telemetering data, Instrumentation, Airborne, Labeled substances, Training devices, Gamma rays, Radioactivity, Gamma counters, Monitors.

The purpose of this project was to perform a development test of the AN/DSQ-5 Scoring Set (formerly the A/A24D-5 (XI-3) Scoring System). Ground firings of radioactively tagged 20mm ammunition were conducted to determine the performance characteristics of the set. Also, problems associated with testing radioactive scorers were noted. It was concluded that the scorer, as tested, performed well when the miss distance was 20 ft or less. It was also concluded that radioactive tagging of the projectiles externally created many decontamination problems. It is re-

commended in the report that, in future tests of this type, some method of placing the radioactive tags inside the projectiles be investigated. (Author)

AD-435 618 Div. 30, 8
OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
A SENSITIVE VIBRATION MAGNETOMETER,
by Kurt J. Linden. Jan 64, 29p.
Proj. 5621
AFCRL 64 13 Unclassified report

Descriptors: (*Magnetometers, Vibration), (*Vibration, Magnetometers), Cryogenics, Coils, Magnetic moments, Magnetic fields, Sensitivity, Oscillators, Temperature control, Low temperature research, Electrical properties.

A vibrating sample magnetometer capable of measuring magnetic moments as small as 2 x 10 -6th power emu (that is, gauss-cm to the 3th power) has been put into operation. The instrument is basically of the Foner type, consisting of a speaker-driven rod holding the sample at one end. For measurements between 4.2 and 77 K, the sample is located in the inner part of a double dewar system; the signal coils are rigidly mounted and immersed in the liquid nitrogen of the outer dewar. By immersion of the coils in liquid nitrogen, the thermal noise voltage is reduced by a factor of seven below that at 300 K, and a sensitivity of 2x10 -6th power emu is therby achieved. For temperatures between 77 and 600 K, cryogenic coil techniques require an increase in sample to coil distance that more than offsets the improvement due to reduced thermal noise. To achieve high sample temperatures and maintain the coils at as low a temperature and as close to the sample as possible, a lava coil holder is used in which pre-cooled gas can be passed around the coils. Samples are mounted on the ends of 1.55-mm diameter ceramic rods; sample temperatures are measured by thermocouples located directly adjacent to the sample in the gas flow. For the temperature region from 77 to 600 K, the instrument sensitivity is reduced to 10 -to the -5th power emu. (Author)

AD-435 674 Div. 30, 8
OTS price $3.00

Missiles Systems Div., Lockheed Aircraft Corp., Palo Alto, Calif.
RESEARCH ON AUTOMATIC COMPUTER ELECTRONICS.
VOL. III. SYSTEM DESIGN RESEARCH.
Final rept. 1 Sep 62-10ct 63,
by Richard I. Tanaka. Feb 64,
Contract AF33 657 8777, Proj. 7062, Tasks 706203 and 706204
RTD TDR63 4173, vol. 3 Unclassified report

Descriptors: (*Computers, Design), Programming (Computers), Digital computers, Coding, Switching circuits, Costs, Computer logic, Programming languages, Numerical analysis, Computer storage devices, Data processing systems.

This volume, which describes results in the Phase C effort on systems design research, covers work on developing tools and techniques intended to lead to a rational integrated approach to the design of digital computer systems. A section on computer system design theory describes the steps followed in the overall design of a digital computer system, discusses the state of development of the techniques used in the various design steps, and proposes methods for advancing and automating some of the less undeveloped design steps. The results of a literature survey on heuristic programming are also included, as a preliminary effort to find heuristics which might be applicable to the systems design task. (Author)

AD-435 680 Div. 30
OTS price $2.60

Coordinated Science Lab., Univ. of Illinois, Urbana.
OPTIMAL LINEAR SWITCHING FOR SINGULAR LINEAR SYSTEMS,
by R. A. Rohrer and M. Sobral, Jr. Mar 64, 29p.
Rept. no. R196
Contract DA36 039AMC02208E, Proj. 3A99 25 004
Unclassified report

Descriptors: (*Control systems, Optimization), Linear systems, Switching circuits, Circuits.

The bounded-input control of a linear, time-invariant system with quadratic performance index is discussed from the standpoint of simple implementation. In particular the admissible control is constrained to be a linear function of the states fed back through a saturating amplifier. The resulting controlled system not only exhibits the usual maximum-effort made of operation, but also the terminal singular behavior where linear control is in evidence. (Author)

AD-435 692 Div. 30, 12, 8, 26
OTS price $8.60

Oklahoma State Univ. Research Foundation, Stillwater.
A TRANSISTORIZED DIGITAL COMPUTER WITH BOTH REAL AND STORED TIME ANALOG READOUT OF INFORMATION - FOR USE IN DEEP SPACE INVESTIGATIONS OF MICROMETER PHENOMENA.
Final rept.
by Dave C. Mueller. Dec 63, 96p.
Contract AF19 604 5715, Proj. 7667, Task 766702
AFCRL 64 98, App. Unclassified report

Master's thesis. Report on Design, Development, and Construction of Micrometeorite Detection Systems.

Descriptors: (*Data storage systems, Spaceborne), (*Meteors, Detection), (*Detection, Meteors), Digital computers, Production, Computer logic, Switching circuits, Power supplies, Packaged circuits, Mixers (Electronic), Digital-to-analog converters, Weight, Volume, Analog-to-digital converters, Transistors, Reliability (Electronics).

A system was designed and developed, and 24 units produced. Each unit is essentially an electronic system designed for the express purpose of exploiting the data-gathering potential of a specific space vehicle. However, not all selections of the data-gathering system are the original work of the author, some sections having been conceived, developed and carried over from previous contracts. For this reason, only the heart of the system, namely the digital computer section is dealt with in this paper. In this paper a brief historical background of the development of an ''acoustic'' micrometeor detection technique is presented, together with details of the specific system evolved for this application. Various design features which include logic, powering, environment and packaging peculiar to this application are presented and discussed. The last chapter evaluates the final production units in terms of reliability and functional compatibility. (Author)

AD-435 732 Div. 30, 9
OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
SUPPLEMENTAL AERODYNAMIC CALIBRATION RESULTS FOR THE AEDC-PWT 16-FT SUPERSONIC TUNNEL,
by J. H. Nichols. Apr 64, 44p.
Contract AF40 600 1000, ARO Projs. PS2305, PS2407
AEDC TDR64 76 Unclassified report

Descriptors: (*Supersonic wind tunnels, Calibration), Aerodynamic characteristics, Test methods, Supersonic flow, Pressure gages, Pitot tubes, Wedges, Misalignment, Wind tunnel nozzles, Pressure.

Aerodynamic calibration data were obtained in the test section of the PWT 16-ft Supersonic Tunnel to supplement previous calibration surveys. Recent surveys covered a ten-foot length of test section immediately downstream of the previously surveyed region. These surveys were obtained with an eight-foot traversing rake utilizing pitot-wedge, pitot, and cone probes. The data obtained from these surveys included the nozzle pressure recovery and the Mach number and flow misalignment distributions on and east and west of the tunnel centerline. Correlations of average centerline Mach number and pressure recovery with corresponding measurements obtained with a retractable pitot-wedge probe were obtained at nozzle contour numbers from 2.25 to 3.00. (Author)

AD-435 738 Div. 30, 9
OTS price $1.50

Minnesota U., Minneapolis.
DESIGN AND INSTRUMENTATION OF A WATER FLOW CHANNEL AND APPLICATION TO SOME AERODYNAMIC PROBLEMS,
by Shukry K. Ibrahim. Mar 64, 54p.
Contract AF33 616 8310, Proj. 6065, Task 606503
RTD TDR63 4024 Unclassified report

Descriptors: (*Water tunnels, Deceleration), (*Gas flow, Test facilities), Subsonic characteristics, Transonic characteristics, Supersonic characteristics, Instrumentation, Flow visualization, Compressible flow, Schlieren photography, Theory, Aerodynamic characteristics.

A water flow channel was built to complement an existing water tow channel for investigating, by analogy, certain problems of aerodynamic deceleration in the subsonic, transonic, and low supersonic regimes. After a brief summary of earlier work, the mathematical basis of the analogy is presented. Then, some significant design characteristics and construction features of the facility are described and details of the instrumentation are given. There follows an outline of the experimental and data reduction procedures illustrated by typical experimental results including some Schlieren and shadowgraph pictures and numerical results of simulated pressure distribution tests. (Author)

AD-435 751 Div. 30, 2
OTS price $5.60

Army Electronics Research and Development Activity, White Sands Missile Range, N. Mex.
ACOUSTIC MEASUREMENTS OF WIND THROUGH A LAYER,
by Richard D. H. Low. Mar 64, 53p.
DA Task 1G6 20901A040 06
AERDA 125 Unclassified report

Descriptors: (*Wind, Velocity), (*Anemometers, Acoustic equipment), Measurement, Sound generators, Microphones, Guided missile trajectories, Theory, Sound transmission.

A simple acoustic device for improved measurements of the mean horizontal air flow through an atmospheric layer between the surface and an elevation of 200 feet is described. It consists of a sound generator and four microphones arranged in the shape of a symmetrical tetrahedron. The wind in this layer is acoustically weighted and integrated along the path length from the surface, where the microphones are located, to the top of the layer, where the sound generator is placed. Results obtained with this acoustic device compare favorably with the data collected from conventional wind sensors. (Author)

AD-435 760 Div. 30, 8
OTS price $5.00

Lockheed Missiles and Space Co., Palo Alto, Calif.
RESEARCH ON AUTOMATIC COMPUTER ELECTRONICS.
VOL. I. COMPUTER DEVICE AND CIRCUIT RESEARCH.
Final rept. for 1 Sep 62-1 Oct 63,
by Richard I. Tanaka. Feb 64, 345p.
Contract AF33 657 8777, Proj. 7062, Tasks 706203; 706204
RTD TDR63 4173, vol.1 Unclassified report

Descriptors: (*Digital computers, Scientific research), (*Computer logic, Digital computers), Circuits, Automatic, Switching circuits, Computer storage devices, Ferrites, Circuit interconnections, Cryogenic storage devices, Hall effect, Coils, Magnetic cores, Gain, Coding, Phonons, Solid state physics, Tunnel diodes, Tunneling (Electronics), Thin films (Storage devices), Semiconducting films, Superconductivity.

This report is one of three volumes describing results of a 13-month applied research program called RACE, Research on Automatic Computer Electronics. The program is a broad-front applied research investigation in the area of discrete-variable technology. The report describes results obtained as well as investigations in progress. The computer device and circuit research work described includes a phenomena survey intended to develop possible new directions for later research. The information is presented both as short descriptions of the various phenomena, and also as summary lists developed from punched-card abstracts. Experiments in the solid-state physics area are described which have resulted in the following devices or designs: a ternary logic element, the design of a ternary threshold element, a cryogenic ternary storage element, the design of a memory array using ternary storage elements, and the design of a variable gain threshold element. The descriptions of the work on ferrite logic include discussion of various single-unit flux-steered ferrite devices, as well as experimental results obtained in performing selected parallel logic operations. (Author)

AD-435 775 Div. 30, 32
OTS price $8.60

Radio Corp., of America Data Systems Center, Bethesda, Md.
ADVANCED CHARACTER RECOGNITION TECHNIQUES STUDY. APPENDIX D. TETRAGRAMS LEGAL WITH RESPECT TO WEBSTER'S INTERNATIONAL DICTIONARY. (UNABRIDGED, SECOND EDITION).
Final rept., 1 Jan-31 Dec 63.
31 Dec 63, 97p. Rept. no. 4
Contract DA36 039AMC00112E, Task 1G023201A100 02 09
Unclassified report

Descriptors: (*Dictioniaries, Character recognition), (*Character recognition, Dictionaries), Coding, Tables, Printing, Language.

AD-435 778 Div. 30
OTS price $9.60

Institute of Geophysics and Planetary Physics, Univ. of Calif., San Diego.
A USER'S GUIDE TO BOMB. A SYSTEM OF PROGRAMS FOR THE ANALYSIS OF TIME SERIES,
by E. C. Bullard, F. E. Oglebay, W. H. Munk and G. R. Miller. Apr 64, 119p.
NSF Grant 13575
Unclassified report

Descriptors: (*Data processing systems, Programming (Computers)), Digital systems, Experimental data, Coding, Series.

This version of the User's Guided supersedes a preliminary version which was issued in August of 1962. The user of the preliminary version should note changes in the control statements CYCLE, OPTION, KEEP, INSERT, END, MERGE, NORM, SARIT, and CROSC. Of these, only those to CYCLE, OPTION and MERGE will prevent a previously satisfactory control list from running. The functions indicated by numbers in the second item of the SARIT control statement have been changed and control statements READF, READF2, ENDFIL, TRUNC2, FOURTR and HARM added. In the CYCLE and OPTION control statements, the word CHK has been substituted for IND. The guide has been extensively rewritten to improve its intelligibility. (Author)

AD-435 787 Div. 30, 9
OTS price $8.10

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
VON KARMAN GAS DYNAMICS FACILITY ARO, INC. TECHNICAL DEVELOPMENTS.
1964, 83p.
Unclassified report

Descriptors: (*Air Force research, Test facilities), Cratering, Supersonic wind tunnels, Hypersonic wind tunnels, Test methods, Instrumentation, Design, Operation, Model tests, Hypervelocity projectiles, Blunt bodies, Conical bodies, Supersonic characteristics, Hemispherical shells, Slender bodies, Cylindrical bodies, Axially symmetric flow, Two dimensional flow, Boundary layer control systems, Blast, Shock waves, Heat transfer, Friction, Laminar boundary layer, Supersonic flow, Hypersonic flow, Viscosity, Density, Superaerodynamics, Impact shock, Hypervelocity projectiles, Terminal ballistics, Laminar flow, Aerodynamic control surfaces.

AD-435 807 Div. 30, 32
OTS price $6.60

Autonetics Downey, Calif.
BIBLIOGRAPHY ON LANGUAGES RELATED TO COMPUTERS,
by C. F. G. Lyau. 31 Mar 64, 62p. Rept. no. T4 483 3111
Unclassified report

Descriptors: (*Bibliographies, Programming language), (*Programming language, Bibliographies), Design, Analysis, Reports, Periodicals, Computer.

This bibliography was prepared to provide readily available references of current information on computer languages. This subject is divided into two major areas: (1) the philosophy, structure and design of Computer Languages; (2) the analysis and interpretation of Natural Languages as related to Computers. There are 178 references, which include books, reports, papers and periodical articles. Although the literature search covered the periods 1946 through 1963, the most pertinent references were available during 1959 through 1963. (Author)

AD-435 816 Div. 30, 9
OTS price $1.50

Air Force Flight Dynamics Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
EXPERIMENTAL STUDIES OF HIGH TEMPERATURE HYPERSONIC DIFFUSERS.
Rept. for Sep-Dec 63,
by Richard T. Smith. Feb 64, 56p.
Proj. 1426, Task 142612
FDL TDR64 4 Unclassified report

Descriptors: (*Hypersonic wind tunnels, Hypersonic diffusers), Conical bodies, Hypersonic characteristics, Aerodynamic configurations, Design, Test facilities, Hypersonic flow, Pressure, Recovery, Interference.

The effect of various diffuser configurations and blunted cone models on tunnel blockage and pressure recovery of a high temperature hypersonic gasdynamics facility is presented. These studies were conducted in the RTD One-Megawatt Prototype Electrogasdynamic Facility operating continuously with dry air. All data were obtained with frozen flow at Mach number 7.6, a stagnation enthalpy of 3000 BTU/lb, and an arc chamber pressure of 7 atmospheres. To determine the effects of extreme air temperature, the total enthalpy was varied to 6000 BTU/lb with one diffuser configuration. (Author)

AD-435 842 Div. 30
OTS price $1.10

G. E. Co., Schenectady, N. Y.
ELECTRON TIME-OF-FLIGHT VELOCITY SELECTOR.
Quarterly rept. no. 5 for period ending 31 Jan 64.
by G. C. Baldwin and S. I. Friedman. 31 Jan 64, 6p.
Contract NOnr3942 00
Unclassified report

Descriptors: (*Electrons, Spectroscopy), (*Spectroscopy, Electrons), Velocity, Time, Probability, Gases, Deflection, Electrodes, Gold, Photoelectric effect, Photoelectrons, Electric potential, Measurement, Energy.

A time-of-flight velocity selector was constructed that is designed for measurement of the collision probabilities in gases of electrons in the energy region below 1 V, since beam-deflection methods become very difficult and few data exist in this energy region. In this spectrometer, a gold photoemitter, illuminated by a zinc spark gap, repetitively emits bursts of electrons with a continuum of energies from 0 to about 1 eV. The electrons drift up a well-shielded drift chamber coated with aquadag. A portion pass through a gold grid 44 cm from the emitter, into an accelerating field that imparts energy sufficient for detection by a phosphor or secondary multiplier, and are registered by time analysis. Design problems are discussed. Measured photoelectron time spectra are compared with the energy spectrum obtained by the retarding-potential method. (Author)

AD-435 843 Div. 30
OTS price $1.10

Army Missile Command, Redstone Arsenal, Huntsville, Ala.
STANDARD PROCEDURE FOR USING UNITS OF MASS, WEIGHT, FORCE, PRESSURE AND ACCELERATION,

by A. E. Schuler. 1 Mar 1960, 10p.
AMC RA DT TM160 Unclassified report

Descriptors: (*Measurement, Standards), Standardizatio, Pressure, Gravity, Acceleration, Weight, Force (Mechanics), Guided missile components.

AD-435 852 Div. 30
OTS price $8.60

Radio Corp. of America, Bethesda, Md.
ADVANCED CHARACTER RECOGNITION TECHNIQUES STUDY.
Final rept. 1 Jan-31 Dec 63,
by R. B. Thomas, M. Kassler and G. Woolley.
31 Dec 63, 93p. Rept. no. 4
Contract DA36 039AMC00112E, DA Task 1G023201A100 02 09
Unclassified report

Descriptors: (*Character recognition, Reading machines), (*Reading machines, Character recognition), Automatic, Data processing systems, Programming (Computers), Language, Communication theory, Coding, Computer logic, Design, Theory, Input-output devices.

This report presents the results of the fourth research phase and summarizes the work of all phases of a study aimed at developing techniques to enhance the output of a hypothetical character-recognition machine by producing solutions in those instances where the machine fails to identify a character within an English word in normal technical text material. The development of the grammar approach, in contrast to dictionary look-up, is traced and evaluated. The context grammar G sub 2 and the list of legal tetragrams from the entries of Webster's unabridged dictionary, second edition, are displayed in full. The use of morphemic analysis, syntax analysis, word lists, matching in text, and other related techniques are discussed. Recommendations for further study are given. (Author)

AD-435 883 Div. 30, 13
OTS price $8.60

Sperry Gyroscope Co., Great Neck, N. Y.
DESIGN CRITERIA STUDY FOR HIGH POWER HIGH VOLTAGE RESEARCH FACILITY.
Quarterly rept. no. 2, 1 Oct-31 Dec 63.
Jan 64, 99p. Rept. no. EB5296 0359 2
Contract DA36 039AMC03199E, Proj. 1G6 22001A055 04
Unclassified report

Descriptors: (*Electronics laboratories, Military facilities), (*Test facilities, Electronics), Power, Transmission lines, Microwave equipment, Lasers, Radiation weapons, Waveguides, Power equipment, Electric potential, Modulators, Vacuum apparatus, Cooling, Power supplies.

A survey was made of a number of possible uses of the facility including transmission lines, microwave components, lasers, and radiation weapons. A projection of the state of the art for transmission lines for the 1967 and 1977 decade is also included. Power levels of the magnitude anticipated for this period indicate a radical departure from conventional transmission line. The use of high dielectric gases or vacuum will not be sufficient to achieve the required power using conventional waveguide. It presently appears that tall or square waveguide presents an interim solution. However, as research on circular waveguide advances and as power sources for TE01 circular electric mode becomes available, the many desirable features of circular guide will require its use. Delineation of the facility configuration was continued and a description of the auxiliary equipment needed for the facility is included. Analysis of the high voltage power supply and high power modulators was begun. Preliminary results are presented. (Author)

AD-435 993 Div. 30
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A METHOD OF RECORDING BRAIN BIOELECTRICAL CURRENT IN FREELY MOVING RABBITS,
by B. I. Kotlyar. 24 Mar 64, 6p.
FTD TT63 1117 Unclassified report

Trans. from Fiziologicheskiy Zhurnal SSSR, 49:9, pp. 1115-1116, 1963.

Descriptors: (*Electroencephalography, Rabbits), (*Brain, Electrical properties), Motion, Design, Instrumentation, Conditioned reflex.

AD-435 998 Div. 30, 16
OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
MULTIPLE ELECTRODE IMPLANTATION INTO SUBCORTICAL STRUCTURES OF THE HUMAN BRAIN,
by K. V. Grachev. 25 Mar 64, 10p.
FTD TT63 1119 Unclassified report

Trans. from Fiziologicheskiy Zhurnal SSSR, 49:9, pp. 1122-1125, 1963.

Descriptors: (*Brain, Diseases), (*Electrodes, Medical research), Therapy, Wounds and injuries, Central nervous system, Surgery, Neurology.

AD-436 035 Div. 30, 8
OTS price $5.60

Space Technology Labs., Inc., Redondo Beach, Calif.
RESEARCH ON LOW TEMPERATURE COMPUTING ELEMENTS.
by H. T. Mann. Mar 64, 55p. Rept. no. 8971 6009 RU000
Contract Nonr254200
Unclassified report

Descriptors: (*Cryogenic storage devices, Circuits), (*Thin films (Storage devices), Cryogenic storage devices), Dielectric films, Cryogenics, Correlation techniques, Probability, Cryostats, Superconductivity, Indium, Electron guns, Electron beams, Siloxanes, Electron bombardment, Metal films, Polymers.

AD-436 273 Div. 30, 1, 9
OTS price $7.60

Fairchild Camera and Instrument Corp., Syosset, N. Y.
HELICOPTER MAIN ROTOR BLADE TRACKING DEVICE.
Final engineering rept., Jun 60-Sep 62,
by R. Sansone. Feb 64, 76p.
Contract Nonr1767 00
NTDC TR NAVTRADEVCEN9U96 2
Unclassified report

Descriptors: (*Helicopter rotors, Optical tracking systems), Helicopters, Rotary blades (Rotary wings), Operation, Deflection, Measurement, Test equipment, Design, Effective-

ness, Resolution, Optical equipment, Electrical equipment, Misalignment.

The design, development and testing are reported of a Helicopter Main Rotor Blade Tracking Device. In its final configuration, Device 9U96 consisted of a hand-held viewer and its attendant power supply and five corner cube wing tip reflectors of different colors. The device was used to measure the out-of-track of the Main Rotor Blades of an H-37B aircraft. It was found that Device 9U96 was capable of measuring individual out-of-track to less than 1/4 of an inch at the blade cap at night. Testing during the day revealed that the Device did not have full 24-hour capability. (Author)

AD-436 291 Div. 30, 15
OTS price $6.60

University of Southern Calif., Los Angeles, School of Engineering.
ON THE THEORY OF OPTIMAL LINEAR CONTROL SYSTEMS,
by Jack R. Smith and Nasser E. Nahi. Jan 64, 63p. Rept. no. 105
Contract AF04 695 304, Proj. 3182 730F, Task 02
SSD TDR64 61 Unclassified report

Descriptors: (*Control systems, Theory), (*Optimization, Linear systems), Differential equations, Functional analysis, Inequalities, Trajectories, Matrix algebra, Spacecraft.

The derivation of optimal control algorithms for systems which can be represented by ordinary linear differential equations is presented. The results can be used to determine optimal controls for space vehicles. The control vectors considered herein are restricted such that either the norm of the control vector or the time integral of the square of the Euclidean norm of the control vector does not exceed a predetermined constant. If the second restriction applies, the system is said to be subject to the effort constraint, and the corresponding integral is called the control effort. The physical meaning of these restrictions is clear. In any physical system, the quantity of fuel supplied, temperature, current, voltage, etc., cannot take on arbitrarily large values. (Author)

AD-436 292 Div. 30, 12
OTS price $7.60

Electronic Systems Div., Air Force Systems Command, Bedford, Mass.
SUMMARY OF INVESTIGATIONS INTO INSTRUMENTATION CALIBRATION,
by Joseph J. Blum. 31 Jan 64, 75p.
Proj. 5930, Task 5930 03
ESD TDR64 188 Unclassified report

Descriptors: (*Instrumentation, Calibration), (*Calibration, Instrumentation), Guided missile ranges, Guided missile tracking systems, Satellites (Artificial), Errors, Rockets, Rocket trajectories.

This report summarizes several separate but related theoretical investigations into techniques and approaches to calibration of range instrumentation. Existing calibration techniques are examined in terms of accuracy, cost, and time. Results of a trade-off study examining rocket and/or satellite methods of calibration are presented and the satellite technique is shown to be the most effective. Expressions for modeling of systematic instrumentation errors are presented. A scheme for satellite calibration of the global Satellite Control Facility, which would not require reliance on any external standard, is examined. Detailed analysis of the Atlantic Missile Range MISTRAM and GLOTRAC calibration problem is reviewed and a concept is held forth as the logical primary goal of a program of calibration. The overall conclusion is reached that both satellite and rocket programs of calibration are feasible, if properly designed, but that a satellite program would yield appreciably superior results at far less cost than a rocket program of comparable effectiveness. (Author)

AD-436 297 Div. 30, 23
OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
AN EXPERIMENTAL COMPARISON OF THREE LEARNING MACHINE TRAINING RULES,
by Nils J. Nilsson and Richard C. Singleton. Feb 64, 17p.
Contract AF30 602 2943, Proj. 5581, Task 558104
RADC TDR64 33 Unclassified report

Descriptors: (*Teaching machines, Training), (*Teaching machines, Design), Artificial intelligence, Input output devices, Analysis, Perceptron, Pattern recognition, Learning, Theory, Computer logic.

This report includes the results of a series of experiments to compare the efficiency of training methods using (1,0) and (+1,-1) representatives for patterns. It also presents a theoretical explanation which deals with a single TLV rather than with a network of TLV's as used in the experiments. The effects noted, however, can be expected to pertain to the network also. (Author)

AD-436 347 Div. 30
OTS price $2.60

Stanford Research Inst., Menlo Park, Calif.
CLASSIFICATION AND GENERALIZATION CAPABILITIES OF LINEAR THRESHOLD UNITS,
by Thomas M. Cover. Feb 64, 23p.
Contract AF30 602 2943, Proj. 5581, Task 558104
RADC TDR64 32 Unclassified report

Descriptors: (*Learning machines, Networks), Artificial intelligence, Computer logic, Pattern recognition, Linear systems, Set theory, Algebraic topology, Probability, Sequences.

This report represents work in progress on properties of linear threshold functions. In d dimensional binary space there exists n separate points. Furthermore there exists to the N power possible combinations (dichotomy) of these points. Not all of these combinations can be separated by linear threshold functions. This paper concerns itself with determining which combination can or cannot be separated. Surfaces other than hyperplanes are also studied. These include surfaces obtained by multiple linear threshold devices and quadratic surfaces. Consideration is also given to training procedures in the separation of random patterns by linear threshold devices. (Author)

AD-436 349 Div. 30
OTS price $4.00

Lockheed Missiles Space Co., Palo Alto, Calif.
RESEARCH ON AUTOMATIC COMPUTER ELECTRONICS.
VOL. II. LOGICAL DESIGN RESEARCH.
Final rept., 1 Sep 62-1 Oct 63,
by Richard I. Tanaka. Feb 64, 293p.
Contract AF33 657 8777, Proj. 7062, Task 706203, 706204
RTD TDR63 4173, vol. 2
Unclassified report

Descriptors: (*Computers, Design), Computer logic, Algebras, Circuits, S-matrix, Switching circuits, Special functions, Tables, Set theory, Data storage systems, Special purpose computers.

Threshold logic and ternary logic design research is described in this bolume. The description of threshold logic includes theoretical results usable for synthesizing threshold functions by means of orthogonal expansions, Boolean techniques, or decomposition methods. Design techniques which consider constraints imposed by practical circuit considerations are also described, along with the assumptions which define the constraints. The work on ternary logic is intended to be a prelude to later extension to p-valued logic. The two major approaches followed are: (1) deriving suitable ternary algebra systems which include properties desirable for minimizing logic expressions, and (2) devising methods for expressing ternary functions in forms suitable for implementation by ternary elements. (Author)

AD-436 410 Div. 30
OTS price $4.60

Aeronautical Computer Lab., Naval Air Development Center, Johnsville, Pa.
A PROGRAM FOR THE DETERMINATION OF THE AUTOCORRELATION FUNCTION AND POWER SPECTRUM ON THE IBM 650 TAPE-RAMAC COMPUTER SYSTEM,
by R. S. Huntzinger. 26 Mar 64, 42p.
Task FR10 3 02
NADC AC 6403 Unclassified report

Descriptors: (*Programming languages, Data processing systems), (*Programming (Computers), Statistical functions), Time, Series, Data storage systems, Control sequences, Magnetic tape, Power.

A program is presented for computing the autocorrelation, or more precisely the autocovariance, function for a set of raw data comprising a stationary time series and, on the basis of these computations, determining the power spectrum. The storage capabilities of the IBM 650 tape-RAMAC system have made this program useful for the analysis of large quantities of data from a variety of sources. Future analyses of data both locally and at other activities may be made using this program. (Author)

AD-436 430 Div. 30
OTS price $9.60

Institute of Geophysics and Planetary Physics, La Jolla, Calif.
A USER'S GUIDE TO BOMM. A SYSTEM OF PROGRAMS FOR THE ANALYSIS OF TIME SERIES,
by E. C. Bullard, F. E. Oglebay, W. H. Munk and G. R. Miller. Apr 64, 118p.
Unclassified report

Descriptors: (*Programming (Computers), Handbooks), Programming languages, Time, Series, Control systems.

BOMM is a system of programs which causes an electronic computer to perform arithmetic operations on time series. In devising the system the main objectives were: (1) to enable a wide variety of data formats to be accepted without recoding; (2) to allow gross errors to be removed automatically from the data; (3) to provide a considerable variety of arithmetic operations and leave the user free to choose the order in which they are applied; and (4) to allow further processes to be incorporated into the system. The present User's Guide provides the information needed by the user in operating the system. (Author)

AD-436 526 Div. 30
OTS price $1.10

Electronics Research Lab., Univ. of Calif., Berkeley.
PROGRAM OF SYSTEMS RESEARCH.
Final rept., 1 Feb 63-31 Jan 64,
by A. R. Bergen and G. L. Turin. 19 Mar 64, 4p.
Grant AF AFOSR230 63
AFOSR 64 0726 Unclassified report

Descriptors: (*Communication systems, Research program administration)

AD-436 587 Div. 30
OTS price $3.60

Florida Univ. Engineering and Industrial Experiment Station, Gainesville.
AN INVESTIGATION OF METHODS OF DETECTING AND CORRECTING ERRORS IN DATA TRANSMISSION SYSTEMS.
Final rept.
by W. W. Peterson, M. J. Moss, J. B. O'Neal and E. J. Weldon. Feb 64, 31p.
Contract AF19 628 431, Proj. 5632, Task 563204
AFCRL 64 121 Unclassified report

Descriptors: (*Errors, Corrections), (*Programming (Computers), Errors), Data transmission systems, Programming languages, Communication systems.

A summary of some computations made on Bose-Chaudhuri codes is given. It is shown that there are infinitely many codes for which Bose's bound on minimum distance gives the true value. Also discussed are two theorems relating to the relationship of codewords and their weights. A few weak results on a bit-loss channel, and abstracts of scientific reports on a quantum channel and on binary communication with feedback are included. (Author)

AD-436 590 Div. 30
OTS price $8.10

Ballistic Research Labs., Aberdeen Proving Ground, Md.
GRATIS - A MONTE CARLO COMPUTER PROGRAM FOR CALCULATING TRANSMISSION INFORMATION FOR SECONDARY GAMMA RADIATION,
by Alfred J. Budka. Oct 63, 1v.
RDT & E Proj. 1A022601A088
BRL 1223 Unclassified report

Descriptors: (*Programming languages, Gamma rays), (*Gamma emission, Shielding), (*Programming languages, Monte Carlo method), (*Shielding, Materials), Neutron activation, Radioactive fallout, Bremsstrahlung, Secondary emission.

A computer program, designed to calculate gamma ray transmission information for primary and secondary gamma radiation, is described. The Monte Carlo method is used. The program considers a plane stratified slab of finite thickness and infinite lateral dimensions, consisting of eight slab layers. Each layer may be made of any material. Gamma ray transmission information may be calculated for: (1) neutron induced gamma rays distributed within a slab, (2) plane isotropic gamma ray source located outside of a slab, (3) a plane isotropic gamma ray source located outside of a slab plus neutron induced

gamma rays distributed in the slab, (4) monodirectional beams of gamma rays, and (5) bremsstrahlung originating within the slab. (Author)

AD-436 591 Div. 30
OTS price $5.60

Naval Research Lab., Washington, D. C.
NABUR A NAREC ASSEMBLER FOR THE BURROUGHS D825 MODULAR DATA-PROCESSING COMPUTER,
by Robert M. Mason and Irene G. Fishman.
13 Jan 64, 51p.
Projs. RF001 08 41 4552, SF001 08 01, Task 9249
NRL 5974 Unclassified report

Descriptors: (*Programming languages, Digital computers), Programming (Computers), Control sequences, Data processing systems, Command and control systems.

NABUR, an assembly routine written for the Naval Research Electronic Computer (NAREC), produces object programs suited to the Burroughs D825 Modular Data-Processing computer. The input data for this routine may consist of one or more punched tapes coded in a source language that augments D825 basic machine language. This report discusses conventions to be followed in writing source programs and general aspects of the routine itself. A numerical listing of Burroughs D825 instructions, block diagrams of key subroutines, and a summary of NABUR rules appear as appendices. (Author)

AD-436 824 Div. 30
OTS price $2.60

Army Electronics Research and Development Labs., Fort Monmouth, N. J.
SIGNALING WITH FREQUENCY-SHIFT-KEYED COSINE WAVES,
by E. D. Hanson and R. E. Webb. Nov 63, 21p.
DA Task 1G6 20501A448 02 01
AELRDL TR2363 Unclassified report

Descriptors: (*Signals, Coding), (*Switching circuits, Signals), (*Signals, Frequency shift), Bandwidth, Statistical functions, Mathematical analysis, Series.

A very efficient binary signaling technique (from the standpoint of bandwidth utilization) is described. The power density spectrum of the signal is derived and compared with that of sinusoidal diphase and rectangular diphase. A means for coding and decoding the signal is discussed. An experimental model operating at 16 kilobits per second was constructed. It was tested over the special service channel of the Frequency Division Multiplexing Equipment AN/TCC-7. (Author)

AD-437 123 Div. 30
OTS price $5.60

Instrumentation Lab., Massachusetts Inst. Of Tech., Cambridge.
ATTITUDE DETERMINATION OF A SPHERICAL IMU,
by Donald Garmer. Feb 64, 54p. Rept. no. R 435
Contract AF04 694 305, Proj. DSR52 214
Unclassified report

Descriptors: (*Inertial guidance, Mathematical analysis), Instrumentation, Geometry, Theory, Test equipment, Mathematical models, Attitude control systems, Measurement.

The problem of determining the attitude of a spherical IMU relative to its case is analytically solved in this paper. The problem is divided into three parts. The first part is concerned with the geometry and the second and third parts consider respectively the measurement and computer problems. (Author)

AD-437 163 Div. 30
OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SEQUENTIAL DECODING ON A CHANNEL WITH SIMPLE MEMORY,
by J. E. Savage. 2 Apr 64, 23p. Group rept. no. 1964 5
Contract AF19 628 500
ESD TDR64 42 Unclassified report

Descriptors: (*Programming (Computers), Sequences), (*Search theory, Communication theory), Probability, Statistical functions, Computer logic.

A model for a binary channel with additive Markovian noise is presented. The behavior of the Sequential Decoding cutoff rate, R(comp), for this channel is studied under various degrees of memory. It is shown that R(comp) decreases from its memoryless value whereas channel capacity increases when errors begin to cluster. This apparent paradox is explained and the small-memory deterioation in R(comp) is shown to be correctable by elimination of the channel memory through scrambling. This study should serve primarily as an instrument for understanding the effects of memory on Sequential Decoding. (Author)

AD-437 265 Div. 30
OTS price $3.60

Massachusetts Inst. of Tech., Cambridge.
RECENT ADVANCES IN THE DEVELOPMENT OF A MAGNETIC SUSPENSION AND BALANCE SYSTEM FOR WIND TUNNELS. Interim technical rept., 31 Aug 61-31 Aug 62,
by Eugene E. Covert and Edward Lee Tilton, III.
Dec 63, 31p.
Contract AF33 616 7023, Proj. 7065, Task 7065 01
ARL 63 235 Unclassified report

Report on Aerospace Simulation Techniques Research.

Descriptors: (*Hypersonic wind tunnels, Suspension devices), (*Suspension devices, Hypersonic wind tunnels), Wind tunnel models, Balances, Electromagnets, Calibration, Magnet coils, Roll, Instrumentation, Schlieren photography, Magnetohydrodynamics, Temperature, Pressure, Wind tunnels.

A magnetic model suspension system is described, including an initial calibration procedure and a procedure for controlling the roll degree of freedom of the model. Particular attention is given to the discussion of low density, high temperature limits of the system. A discussion of schlieren optical systems is also presented. (Author)

AD-437 320 Div. 30, 9
OTS price $4.60

Cincinnati U., Ohio.
THEORETICAL OPERATING RANGES AND CALIBRATION RESULTS OF THE ARL TWENTY-INCH HYPERSONIC WIND TUNNEL,
by F. R. Tepe, Jr., D. L. Brown, K. H. Token and W. Hoelmer. Oct 63, 42p.
Contract AF33 616 8453, Proj. 7064
ARL 63 189 Unclassified report

Report on Experimental Aerothermodynamic Investigations.

Descriptors: (*Hypersonic wind tunnels, Calibration), Operation, Pressure, Temperature, Density, Reynolds number, Instrumentation, Wind tunnel nozzles.

Results of calibration tests conducted in the ARL 20 in. hypersonic wind tunnel are presented. Included are total pressure surveys, total temperature surveys, and blockage tests of various model configurations. All tests were conducted with the nominal Mach 14 throat installed in the tunnel. The total temperature survey was carried out in a direction normal to the flow at a fixed axial station, with the total pressure survey being conducted in the normal direction also, but at various axial locations. The models used in the blockage tests included hemisphere cylinders of various sizes and a 20 degree included-angle cone. The range of flow parameters which may be simulated were computed from the predicted operating limits of the tunnel and are presented in graphical form. These graphs include the range of pressure, temperature, density, and Reynolds number possible in the HTS-14. (Author)

AD-437 351 Div. 30
OTS price $1.60

Army Electronics Research and Development Agency, Fort Monmouth, N. J.
QUARTZ CRYSTAL UNIT TEST SET AN/TSM-20(), 2.5 KC TO 1100 KC,
by Walter H. Bowerman and Dennis Pochmerski.
Aug 63, 19p.
AELRDL TR2383 Unclassified report

Descriptors: (*Test sets, Quartz), Test equipment (Electronics), Radiofrequency, Resistance (Electrical), Circuits, Very low-frequency, Low frequency, Medium frequency.

Evaluation of Quartz Crystal Unit Test Set AN/TSM-20() is described. The outstanding characteristic of the AN/TSM-20() is its improved drive/resistance compared to that of the Quartz Crystal Unit Test Set TS-&±)/TSM. A means of modifying the TS-710/TSM is described which will make it essentially identical to the AN/TSM-20() except for the extended frequency range of the latter. (Author)

AD-437 474 Div. 30
OTS price $2.60

General Electric Co., Philadelphia, Pa.
ADVANCED RECORDING SUBSYSTEM.
Interim progress rept. no. 3, 1 Jul-30 Sep 60,
by J. Duryea and E. K. Eby. 31 Oct 60, 28p.
Document no. R60SD473
Contracts AF04 645 24, AF04 647 269
Unclassified report

Descriptors: (*Photographic recording systems, Thermoplastics), (*Thermoplastics, Photographic recording systems), (*Experimental data, Storage), Density, Reentry vehicles, Satellites (Artificial), Temperature analysis, Gases, Tests, Dielectric films.

This report describes the objectives and accomplishments, during July, August and September 1960, and the future plans of the Missile and Space Vehicle Department, General Electric Company, in a program to develop and demonstrate under United States Air Force sponsorship, a thermoplastic film recorder of a type suitable for high-density storage of data in satellites and advanced re-entry vehicles. (Author)

AD-437 565 Div. 30
OTS price $9.60

Virginia U., Charlottesville.
COMPARATIVE STRESS ANALYSIS OF LARGE DYNAMIC ACCELERATORS. PHASE 1. FEASIBILITY STUDIES OF A FLYWHEEL ACCELERATOR.
Summary engineering rept.,
by D. L. Bowers, J. A. Friedericy, C. N. Gaylord and S. E. Thornton. Nov 62, 111p. Rept. no. CE 4462 106 62U
Contract AF29 600 3465
Unclassified report

Descriptors: (*Centrifuges, Flywheels), Feasibility studies, Acceleration, Computers, Stresses, Mechanical properties, Steel, Space environmental conditions, Containers, Test equipment, Models (Simulation), Supports, Costs, Strain (Mechanics), Deflection, Moments, Rotation, Atmosphere entry, Clutches, Velocity, Shafts, Bearings.

A study was made to establish the feasibility of a flywheel accelerator for testing man-machine systems under conditions of space flight. This flywheel must be capable of accelerating a 232,500-lb test package to 300g in five seconds. The flywheel configuration which is recommended is 145 feet in diameter; has 22 linearly-tapered box spokes; and has a subdivided box rim, 12.58 square feet in cross section. This wheel weighs 5 x 10 to the 6th power lb and can be constructed from commercial steels (U. S. Steel, T-1 and HY-80). The static analysis of stresses and displacements of a flywheel have been solved and some of the problems connected with latching-on a capsule have been studied. Also, such areas as power requirements, bearings, and capsule support have been discussed. (Author)

AD-437 575 Div. 30, 12, 2
OTS price $2.50

Kentucky Research Foundation, Lexington.
A THEORETICAL STUDY OF SPACE EQUIVALENT THERMAL CONDITIONS AND THEIR APPLICABILITY.
Rept. for May 63-Jan 64,
by T. A. Auxier. Mar 64, 118p.
Contract AF33 657 11346, Proj. 7164, Task 716409
AMRL TDR64 20 Unclassified report

Descriptors: (*Simulated environment, Space environmental conditions), (*Astronauts, Thermal stresses), (*Manned spacecraft, Simulation), Cylindrical bodies, Humans, Protective clothing, Ranges (Distance), Earth, Moon, Thermal radiation, Heat transfer, Space probes, Mathematical analysis, Tolerances (Physiology), Models (Simulation), Absorption.

Radiation heat transfer calculations are made for a cylindrical model of a 50th percentile suited space man in 7 space configurations: (1) deep space probe, (2) a point 136 miles from the bright side of the moon, (3) a point 136 miles from the surface of the dark side of the moon, (4) a point 500 miles from the surface of the bright side of the earth, (5) a point 500 miles form the surface of the dark side of the earth, (6) a 500 mile circular earth orbit a5d (7) a 136 mile circular moon orbit. Similarily, radiation heat transfer calculations are made for the same space man model in four hypothetical chamber configurations I, II, III and IV. The space results are superimposed on the chamber results in order to determine equivalent temperatures for simulating the given space conditions. For instance, depending on the space suit absorptance, the required chamber III temperature for simulating the deep space probe can vary from

260 to 1150R. With these results the capabilities of the AMRL thermal chamber for simulating any one of the seven space configurations are determined. (Author)

AD-437 610 Div. 30
OTS price $6.60

System Development Corp., Santa Monica, Calif.
ANSWERING ENGLISH QUESTIONS BY COMPUTER: A SURVEY,
by R. F. Simmons. 2 Apr 64, 64p. Rept. no. SP1556
Contract SD97
Unclassified report

Descriptors: (*Machine translation, Programming (Computers)), Language, Computer logic, Character recognition, Computers, Automata.

Fourteen question-answering systems which are more or less completely programmed and operating are described and reviewed. The systems range from a conversation machine to programs which make sentences about pictures and systems which translate from English into logical calculi. Systems are classified as data based, text based, and inferential. Principals and methods of operations are detailed and discussed. It is concluded that the data base question answerer has passed from initial research into the developmental phase. The most difficult and important research questions for the advancement of general purpose language processors are seen to be concerned with measuring meaning, dealing with ambiguities, translating into formal languages and searching large tree structures. (Author)

AD-437 650 Div. 30, 25
OTS price $1.60

Institute of Optics, Univ. of Rochester, N. Y.
THE CONSTRUCTION OF A HELIUM-NEON VISIBLE LASER,
by Douglas C. Sinclair. 1964, 13p.
Grant DA AROD31 124G139
Unclassified report

Descriptors: (*Lasers, Construction), (*Helium, Lasers), (*Neon, Lasers), Operation, Optical equipment components, Vacuum apparatus, Electrodes, Excitation, Radiofrequency power, Mirrors.

This report is intended to describe the constructional details of a Helium-Neon visible (6328A) laser which was built at the Institute of Optics. The description can be conveniently divided into three distinct sections, covering the optical, vacuum and electrical aspects of the construction; these aspects are treated in their respective order. In addition, a section is included to describe the operation of the laser, and a figure included which shows some patterns obtained from the laser. (Author)

AD-437 696 Div. 30
OTS price $4.60

Massachusetts Inst., of Tech., Cambridge.
RECENT ADVANCES IN THE DEVELOPMENT OF A MAGNETIC SUSPENSION AND BALANCE SYSTEM FOR WIND TUNNELS. PART II.
Technical rept. Aug 62-Aug 63,
by Eugene E. Covert, Alan B. Copeland, Timothy Stephens and Edward Lee Tilton, III. Mar 64, 45p.
Contract AF33 616 7023, Proj. 7065, Task 7065 01
ARL 64 36 Unclassified report

Descriptors: (*Suspension devices, Wind tunnel models), (*Magnet coils, Suspension devices), Magnetic fields, Magnets, Power supplies, Attitude control systems, Optical equipment, Feedback, Light, Photoelectric cells (Semiconductor).

This report presents a discussion of the recent development work on a magnetic model suspension and balance system. System equipment additions and modifications are described. A summary of calibration procedures and wind tunnel tests is given. Studies on methods of roll control, magnetic field distribution, and a new digital model position indicator are discussed. (Author)

AD-437 798 Div. 30
OTS price $2.75

General Dynamics/Astronautics, San Diego, Calif.
A USE OF DIGITAL COMPUTERS FOR ALGEBRAIC COMPUTATION.
by D. H. Jirauch and R. A. Westerwick. Mar 64, 134p. Rept. no. AE63 1079
Contract AF33 657 10887, Proj. 8225, Task 822501
RTD TDR63 4200 Unclassified report

Descriptors: (*Algebra, Programming (Computers)), (*Motion, Equations), (*Differential equations, Stability), (*Spacecraft, Motion), Rotation, Numerical methods and procedures, Partial differential equations, Machines, Programming lauguages, Matrix algebra, Computer logic, Satellites (Artificial), Orbital trajectories, Gyroscopes, Bodies of revolution.

Development studies were conducted to establish digital computer programs to accomplish two specific tasks: develop a program which can derive equations of motion of systems in general terms (that is, in non-numeric terms); develop a program which will determine the relationship between the coefficients of a differential equation which define the conditions necessary for periodic solutions. This report also presents the mathematics of the methods, the digital computer programs (and instructions on how to use them), and examples illustrating applications of the programs. (Author)

AD-437 898 Div. 30
OTS price $1.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
ELECTRONIC METHODS FOR DETERMINING YOUNG'S MODULUS AND POISSON'S RATIO OF PORTLAND CEMENT CONCRETE.
Final rept.,
by John H. McCarthy. 16 Apr 64, 42p.
Proj. Y R011 01 028
NCEL TR R295 Unclassified report

Descriptors: (*Concrete, Mechanical properties), (*Strain gages, Electronic equipment), Test equipment.

Electronic methods were developed for measuring strain in portland cement concrete for the purposes of determining Young's modulus and Poisson's ratio, and comparative tests were made of electronic and mechanical methods. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-435 466 Div. 31, 30
OTS price $5.60

Naval Research Lab., Washington, D. C.
CALIBRATION STUDY OF (SFNSY) FLOATING SHOCK PLATFORM. PART 1. OPERATIONS AND INSTRUMENTATION.
by Merval W. Oleson. 17 Mar 64; 56p.
NRL 6069 Unclassified report

Descriptors: (*Underwater explosions, Shock (Mechanics)), (*Test facilities, Barges), (*Shock resistance, Vibration isolators), (*Vibration isolators, Ship auxiliary equipment), (*Ship auxiliary equipment, Shock resistance); Strain gages, Weight, Instrumentation, Barges, Coaxial cables, Recording equipment, Test facilities, Failure (Mechanics), Mounting brackets, Stresses.

A series of 55 underwater explosives were fired against an instrumented Floating Shock Platform (FSP). The FSP is a specially designed barge regularly employed as a shock test vehicle for shipboard equipments up to 40,000 lb; for this calibration study three consecutive test loads-heavy, medium, and light-were installed to simulate actual equipment test conditions. Objectives were to define shock-response characteristics of the FSP under nonstandard attack configurations, and to evaluate shock measuring instrumentation based on accelerometer transducers rather than the commonly employed velocity transducers. Shock-response data is under analysis and will be the subject of a subsequent report; this report deals with operational and instrumentation aspects, including tabulation of the test geometries, test configurations, and the installed instruments. (Author)

AD-435 518 Div. 31
OTS price $1.75

Naval Research Lab., Washington, D.C.
THE PRESENT STATUS OF CHEMICAL RESEARCH IN ATMOSPHERE PURIFICATION AND CONTROL ON NUCLEAR-POWERED SUBMARINES.
Annual progress rept. no. 3, 1962-1963,
by H. W. Carhart and V. R. Piatt. 31 Dec 63, 65p.
Proj. SF013 08 03, Tasks 4092 thru 4095
NRL 6053 Unclassified report

Descriptors: (*Atmosphere, Purification), (*Submarines, Atmosphere), Controlled atmospheres, Nuclear powered vessels, Carbon dioxide, Sampling, Closed ecological systems, Algae, Oxygen, Light, Stability, Oxidation, Temperature.

Emphasis at present is being devoted almost exclusively to nuclear-powered submarines. Considerable progress has been made in the major efforts of developing: (1) the sulfate-cycle system for the electrolytic generation of oxygen from water and the absorption of carbon dioxide, (2) additives to decrease the degradation of monoethanolamine (MEA) in the CO_2 scrubber, and (3) improved methods of sampling and analysis of atmospheres. Other topics covered in the present report include the use of algae for oxygen production and carbon dioxide absorption an assessment of CO_2 removal systems, and catalytic combustion studies using hopcalite. (Author)

AD-435 753 Div. 31, 14
OTS price $4.60

Naval Applied Science Lab., Brooklyn, N. Y.
REPORT OF INVESTIGATION OF FIRE TESTS ON SUBMARINE HULL INSULATION MATERIALS.
Final rept.,
by I. Resnick and S. E. Yustein. 3 Apr 64, 42p.
Lab. Proj. 6247 1, Suppl. no. 1, SR007 03 04, Task 1013
Unclassified report

An expanded version is available to U. S. Military Organizations only as AD-435 752L.

Descriptors: (*Submarine hulls, Thermal insulation), (*Thermal insulation, Submarine hulls), (*Flammability, Submarine hulls), Expanded plastics, Isocyanate plastics, Glass textiles, Vinyl plastics, Fire-resistant textiles, Coatings, Laminates, Cork, Fire safety, Combustion, Test methods.

The burning characteristics of various thermal insulation materials were investigated with a view to determining their comparative suitability for submarine hull insulation. The types of materials represented included (1) urethane foam constructed with a laminated barrier material (an insulation system previously developed by the U. S. Naval Applied Science Laboratory), (2) corkboard, (3) expanded vinyl plastic, and (4) fibrous glass board. The fibrous glass board, although not used as submarine hull insulation, was included in this program for comparison purposes. The fire tests conducted were (1) NAVAPLSCIENLAB Large Scale Fire Tests, (2) Columbia Fire Tests, (3) NAVAPLSCIENLAB Decking Fire Tests, (4) ASTM Flammability Tests, and (5) Underwriters' Laboratories Fire Tests. On the basis of the data and information obtained, it was concluded that the urethane foam constructed with a laminated barrier, was characterized by less hazardous factors than the corkboard or the expanded vinyl foam. None of the 5 tests were found completely satisfactory for evaluating the burning characteristics of a thermal insulation material for submarine hulls. (Author)

AD-436 016 Div. 31
OTS price $1.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
SHOCK ABSORBER SYSTEM FOR CONNECTING 3 X 15 CAUSEWAY TO LST.
Final rept.,
by R. C. Towne and G. D. McDougall. 8 Apr 64, 44p.
Proj. Y F015 11 02 314
NCEL TR R292 Unclassified report

Descriptors: (*Landing craft, Bridges), (*Bridges, Floats), (*Floats, Springs), (*Springs, Bridges), Water waves, Stresses, Cables (Mechanical), Mooring, Chains, Tensile properties, Deformation, Compressive properties.

Suitable gear and techniques are needed for connecting an LST to a 3 x 15 pontoon causeway in the surf. Three methods of connection were developed and tested. Test results indicate that spring-mounted bumpers integral with the causeway are a satisfactory method for joining and maintaining a connection with an LST in a 6-foot surf. It was concluded from observations of the shock absorber barge during tests that the system is feasible. It is recommended for in-service testing. (Author)

AD-436 586 Div. 31
OTS price $5.60

Norfolk Naval Shipyard, Portsmouth, Va.
1963 VIBRATION SURVEY REPORTS.
1963, 56p.
Unclassified report

Descriptors: (*Ships, Vibration), Hulls (Marine), Performance (Engineering), Shipyards, Noise, Bearings, Gears, Blowers.

AD-436 877 Div. 31
OTS price $1.25

Lessells and Associates, Inc., Boston, Mass.
PRELIMINARY ANALYSIS OF BENDING-MOMENT DATA FROM SHIPS AT SEA.
Progress rept. no. 2,
by D. J. Fritch, F. C. Bailey and N. S. Wise.
27 Dec 63, 41p.
Contract NObs77139, Proj. SR153
SSC 153 Unclassified report

Report on Ship Response Statistics.

Descriptors: (*Ships, Stresses), (*Stresses, Ships), Data, Cargo ships, Data processing systems, Atlantic ocean, Ocean waves, Pressure, Mathematical models, Statistical analysis, Mathematical prediction, Tables.

Data playback, manual reduction and analysis techniques, and the automatic system to be used for future analysis are presented. Examples are given of some forms of longterm trends. Useful data were obtained on over 85% of voyages representing three ship-years of operation of a C-4 dry cargo vessel on North Atlantic trade routes. Two complete voyages were analyzed using manual techniques; the results of this analysis are given. The maximum observed peak-to-peak variation of wave-induced stress was 8300 psi which occurred during a Beaufort 11-12 Sea. A prediction based on the limited amount of long-term data available from the two analyzed voyages yielded an extreme value of 10,290 psi for a year of operation of this ship type on North Atlantic route. Stress variations on the order of 9,000 psi were observed during the dry docking of the two instrumented ships. (Author)

AD-437 138 Div. 31
OTS price $1.25

Lessells and Associates, Inc., Boston, Mass.
PRELIMINARY ANALYSIS OF BENDING-MOMENT DATA FROM SHIPS AT SEA.
Progress rept. no. 2,
by D. J. Fritch, F. C. Bailer and N. S. Wise.
27 Dec 63, 34p.
Contract NObs77139
SSC 153 Unclassified report

Report on Ship Response Statistics. Available from OTS as PB 181 557.

Descriptors: (*Cargo ships, Stresses), (*Stresses, Data), (*Data, Analysis), Atlantic Ocean, Water waves, Statistical analysis, Velocity, Statistical distributions, Mathematical prediction, Analog computers, Data processing systems, Tables.

Data playback, manual reduction and analysis techniques, and the automatic system to be used for future analysis are presented. Examples are given of some forms of presentation of long-term trends. Useful data have been obtained on over 85% of voyages representing three ship-years of operation of a C-4 dry cargo vessel on North Atlantic trade routes. Two complete voyages have been analyzed using manual techniques and the results of this analysis are presented. The maximum observed peak-to-peak variation of wave-induced stress was 8300 psi which occurred during a Beaufort 11-12 Sea. A prediction based on the limited amount of long-term data available from the two analyzed voyages yielded an extreme value of 10,290 psi for a year of operation of this ship type of North Atlantic route. Stress variations on the order of 9,000 psi have been observed during the dry docking of the two instrumented ships. (Author)

AD-437 177 Div. 31, 4
OTS price $.50

Naval Research Lab., Washington, D.C.
CATALYTIC COMBUSTION OF NUCLEAR SUBMARINE ATMOSPHERIC CONTAMINANTS.
Final rept.,
by J. G. Christian and J. E. Johnson. 20 Mar 64, 17p.
Proj. SF013 08 03 4092 4095
NRL 6040 Unclassified report

Descriptors: (*Submarines, Nuclear-powered vessels), (*Controlled atmospheres, Contamination), Combution, Catalysts, Oxides, Copper compounds, Manganese compounds, Dioxides, Spectra (Infrared), Chromatographic analysis, Benzene, Hydrocarbons, Aromatic compounds, Glycols, Ethers, Alcohols, Phenols, Esters, Organic phosphorus compounds, Halogenates hydrocarbons, Fluorine compounds, Chlorine compounds, Bromine compounds, Ammonia, Amines, N-heterocyclic compounds, O-heterocyclic compounds.

AD-437 303 Div. 31
OTS price $3.60

Woods Hole Oceanographic Institution, Mass.
DEEP SUBMERGENCE RESEARCH.
Rept. for 1 Nov 62-31 Dec 63.
Feb 64, 38p. Ref. no. 64 1
Contract Nonr348400
Unclassified report

Descriptors: (*Oceanographic vessels, Diving), Design, Testing, Instrumentation, Ship models, Hulls (Marine), Underwater, Hydrodynamics, Hydrostatic pressure.

The deep submergence research program at the Woods Hole Oceanographic Institution has centered around the procurement of ALVIN, a two man submersible designed for a 6,000 foot depth, and the necessary adjuncts to the same. The progress of the design and construction of this craft is given with emphasis on the testing and inspection rather than engineering details. An outline of the acceptance testing planned for the completed vehicle is included. The instrument system to be used with the vehicle is discussed, as is the necessary support equipment. Reports on model tests performed during this time, including a collapse test of a one-sixteenth scale model of the ALUMINAUT, are referenced but not discussed in detail. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-435 102 Div. 32, 30
OTS price $12.00

Mitre Corp., Bedford, Mass.
FIRST CONGRESS ON THE INFORMATION SYSTEM SCIENCES. SESSION 10. JOINT MAN-COMPUTER LANGUAGES.

Mar 64, 169p. Rept. no. SS 10
Contract AF33 600 39852, Proj. 704
ESD TDR63 474 10 Unclassified report

Descriptors: (*Programming language, Computers), (*Information retrieval, Automatic), (*Symposia, Information retrieval), Verbal behavior, Language, Data processing systems, Data storage systems, Theory, Subject indexing, Vocabulary, Test methods, Selection, Computer storage devices, Decision making, Mathematical analysis.

AD-435 485 Div. 32
OTS price $1.10

RAND Corp., Santa Monica, Calif.
THE GROWTH OF SOVIET CONSUMPTION SINCE 1958: COMMENTS ON I. ERRO'S AND WHAT OF THE CONSUMER.
by Abraham S. Becker. Mar 64, 8p. Rept. no. P 2893
Unclassified report

Descriptors: (*Commerce, Growth), (*Commerce, Communists), Economics, Industries, Banking, Wages.

AD-435 486 Div. 32
OTS price $1.60

RAND Corp., Santa Monica, Calif.
CONTINUOUS AND DISCONTINUOUS RATES OF CHANGE,
by Russell T. Nichols. Mar 64, 18p. Rept. no. P2891
Unclassified report

Descriptors: (*Economics, Commerce), (*Commerce, Continuous fractions), (*Economics, Growth), Errors, Mathematical analysis, Costs, Mathematical prediction.

AD-435 615 Div. 32
OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
AUTOMATED ROUTINES IN TECHNICAL SERVICES,
by Patricia T. Sievers and Paul J. Fasana.
Feb 64, 21p.
AFCRL 64 70 Unclassified report

Presented at the Seventh Military Librarians' Workshop, 2-4 October, 1963, Silver Spring, Maryland.

Descriptors: (*Libraries, Automation), (*Automation, Libraries), Documentation, Data processing systems, Information retrieval, Effectiveness, Photographic techniques, Typewriters, Input-output devices.

This paper discusses the approach to automation taken by the AFCRL Research Library, applicable to libraries in general. A brief review of the current market of equipments and techniques is followed by guidelines this library will use in order to effect total systems automation. The AFCRL Research Library monograph processing system is discussed as an application of the techniques described. It covers the preliminary search routines using an MP-3 Polaroid camera, the cataloging routines making use of various machine-generated authority lists, the bibliographic encoding and catalog-card generation using tape typewriters, and the special-purpose data-processing device, the Itek Crossfiler, developed for this library. (Author)

AD-435 636 Div. 32
OTS price $2.60

RAND Corp., Santa Monica, Calif.
SIGNS OF STRESS IN SOVIET POLITICAL-MILITARY RELATIONS,
by Thomas W. Wolfe. Mar 64, 25p. Rept. no. P2877
Unclassified report

Descriptors: (*Political science, Communism), (*Military strategy, Communists), Military organizations, Foreign policy, Armed forces (Foreign), Public relations, Leadership, Stress (Psychology), Decision making.

AD-436 523 Div. 32, 30, 16
OTS price $7.60

Institute for Scientific Information, Philadelphia, Pa.
MECHANIZED INDEXING STUDIES OF MSD TOXICITY. PART I AND PART II,
by John O'Conner. Jan 64, 72p.
Contracts Nonr418300 AF49 638 1300
AFOSR 64 0682 Unclassified report

Descriptors: (*Subject indexing, Automation), (*Information retrieval, Toxicity), (*Toxicity, Subject indexing), Computer, Feasibility studies, Design.

Mechanized indexing possibilities are being studied by searching for computer rules which will duplicate indexing done by subject specialists for a pharmaceutical retrieval system, Toxicity (including side effects) is the first term studies. A random hundred documents, containing thirteen toxicity papers, is the first sample. Computer-generated word frequency lists for each paper aid the work. The much discussed keyword approach is tried first. A thesaurus group of likely toxicity keywords is derived from the retrieval system's indexing guide, a medical dictionary, and the papers in the sample. Frequencies and document places (occurrence in titles, summaries, headings, etc..) of keywords, and differing weights for keywords, are used to try to reduce keyword overassigning of toxicity. Frequencies do not appear to help. Weighting helps some. Occurrence in summaries helps more. No keywords occur in titles. The Appendices (bound separately) include a bibliography of all sample papers containing keywords. Each reference is accompanied by a brief summary of the paper, and brief summaries of the passages containing keywords. Another Appendix gives for each paper its word length and the identity, document places, and frequences of the keywords it contains. Another Appendix contains the full texts or excerpts of the five toxicity papers which appear to contain no keywords. (Author)

AD-436 767 Div. 32, 15
OTS price $5.60

Princeton Univ., N. J.
A PRICE LEADERSHIP METHOD FOR SOLVING THE INSPECTOR'S NON-CONSTANT-SUM GAME,
by Michael Maschler. 5 Sep 63, 56p. Rept. no. RM60
Contract Nonr185816
Unclassified report

Descriptors: (*Economics, Game theory), (*Game theory, Costs), Leadership, Decision making.

An inspector's game is a non-constant sum 2-person game in which one player has promised

to perform a certain duty and the other player is allowed to occasionally inspect and verify that the duty has indeed been performed. A solution to a variant of such a game is given in this paper, based on the assumption that the inspector can announce his mixed strategy in advance, if he so wishes, whereas the other player, who has already given his promise, cannot threat by explicitly saying that he will not keep his word. (Author)

AD-436 768 Div. 32, 15
OTS price $2.60

Princeton Univ., N. J.
PARETO OPTIMUM AND ECONOMIC ORGANIZATION,
by Oskar Morgenstern. 24 Jan 64, 24p. Rept. no. RM63
Contract Nonr185816
Unclassified report

Descriptors: (*Economics, Game theory), Social science, Costs, Decision making, Theory.

This paper examines some of the hidden, though essential assumptions of the notion of the Pareto Optimum. It shows that there are implicit limitations placed upon the amounts or physical properties of the additions made to the possessions of an individual so that the others, whose position is not to deteriorate, will agree that such is the case. It is shown that bluff may occur and also cooperation among the participants in which case there is no maximum at all but an n-person cooperative game. In that case the objective observer too is involved in a game. Finally, it is asked how dynamic aspects could be taken into consideration, pointing up a further complication apparently neglected in the literature. (Author)

AD-436 769 Div. 32, 15
OTS price $8.10

Princeton Univ., N. J.
A SPECTRUM ANALYSIS OF SEASONAL ADJUSTMENT,
by Michael D. Godfrey and Herman F. Karreman.
Apr 64, 82p. Rept. no. RM64
Contract Nonr185816; Grant NSF GS30
Unclassified report

Descriptors: (*Economics, Seasonal variations), (*Time, Series), Linear systems, Model theory, Operators (Mathematics), Scheduling, Graphics, Least squares method.

The methods of cross-spectrum analysis are applied to the problem of the seasonal adjustment of economic time series. In all, four methods are analyzed by means of empirical analysis of the results of applying the methods to artificially generated time series of known composition. Three of the four analyzed seasonal adjustment methods are known in the literature while the fourth method was developed on the basis of analysis of the other three. The three methods are: Hannan's method, Wald's method, and the Census Method. The fourth method is termed the rational-function method. It is found that there exist considerable differences in performance between the various methods when the seasonal varies with time. Hannan's method estimates (in an efficient, unbiased way) a constant seasonal, and thus is unsuited to the estimation of variation in the seasonal. The Wald and rational-function methods are able to estimate relatively more rapid changes in the seasonal amplitude than is the case with the Census Method. However, the Census Method and the Rational-function method both estimate changes in seasonal pattern which Wald's method takes as constant. (Author)

AD-436 827 Div. 32, 31
OTS price $14.50

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
CONSOLIDATED LIST OF INFORMATION RETRIEVAL WORDS.
1960, 214p.
NAVWEPS LS 3 Unclassified report

Descriptors: (*Information retrieval, Vocabulary), (*Naval research, Dictionaries), (*Indexes, Naval research), Ordance, Weapons, Ships, Naval aviation, Naval training, Training devices, Language.

AD-436 843 Div. 32, 22
OTS price $10.50

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
ROOT - TERM GLOSSARY FOR THE SUBJECT ANALYSIS OF TECHNICAL REPORTS, WITH COMPUTER CODES FOR USE WITH THE NOL 7090 RETRIEVAL PROGRAM.
1960, 138p.
NAVWEPS LS5 Unclassified report

Descriptors: (*Subject indexing, Vocabulary), (*Weapons, Indexes), (*Vocabulary, Weapons), Analysis, Coding, Language, Programming language.

AD-436 844 Div. 32, 1
OTS price $6.60

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
ROOT-TERM VOCABULARY FOR THE SUBJECT ANALYSIS OF TECHNICAL REPORTS IN AERONAUTICAL AND RELATED FIELDS IN THE TECHNICAL LIBRARY COLLECTION.
Aug 60, 61p.
NAVWEPS LS4 Unclassified report

In cooperation with Engleman and Co., Inc., Washington, D. C., Contract Noas59 6243c.

Descriptors: (*Vocabulary, Analysis), (*Subject indexing, Vocabulary), Scientific research, Language, Documentation, Aeronautics.

AD-437 627 Div. 32, 17
OTS price $1.10

Belfour Engineering Co., Suttons Bay, Mich.
TITANIUM ALLOY 6Al-4V.
Dec 63, 7p. Inventory rept. no. 616
Unclassified report

Descriptors: (*Information retrieval, Mechanical properties), (*Titanium alloys, Mechanical properties), Aluminum alloys, Vanadium alloys, Tensile properties, Cryogenics, High-temperature research, Data.

AD-437 868 Div. 32, 16
OTS price $7.60

Institute for Scientific Information, Philadelphia, Pa.
MECHANIZED INDEXING STUDIES OF MSD TOXICITY, PART II,
by John O'Connor. 1964, 71p.
Contracts Nonr418300; AF49 638 1300
Unclassified report

Descriptors: (*Subject indexing, Automation), (*Toxicity, Subject indexing), Feasibility studies, Information retrieval, Test methods.

A general procedure is described for using the meaning of a paper as a guide in looking for mechanized indexing rules. The procedure involves two basic concepts: (1) A paper saying

something about T (toxicity, or any other index term being studied); and (2) an expression in a paper being evidence that the paper says something about T. Neither of these notions is completely well-defined, but they may be sufficiently intersubjective to help find useful mechanized indexing rules. The application of the procedure to the toxicity papers in the sample described in Part I leads to the thesaurus keywords which were obtained more intuitively in Part I. It also leads to nine additional keywords, which function almost as well for mechanized indexing purposes. The general procedure leads to many other expressions which are also toxicity clues, but which cannot be used directly for mechanized indexing, because they are unlikely to recur in other toxicity papers. Study of these expressions suggests their generalization to expression forms, containing variables. The possible values of the variables are defined for computer use by lists of substance-contact words and disorder words. (Author)

33. TRANSPORTATION

AD-437 120 Div. 33
OTS price $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SNOW COMPACTION - DESIGN CRITERIA AND TEST PROCEDURES.
Final rept.,
by E. H. Moser, Jr. 16 Apr 64, 38p.
Proj. Y F015 11 01 023
NCEL TR R113 Unclassified report

Descriptors: (*Snow, Trafficability), (*Roads, Design), (*Runways, Design), Test methods, Processing, Construction, Hardening, Crystallization, Road building equipment, Density, Temperature, Hardness.

Techniques and equipment are presently available for producing high-strength snow capable of supporting wheeled aircraft with tire inflation pressures up to 75 psi and gross weights up to 75,000 lbs. Current investigations in Antarctic are directed toward increasing the load-bearing capacity of compacted-snow runways on deep perennial snowfields up to 150,000 lbs. Existing criteria are given for the design of compacted-snow roads and runways on annual and perennial snowfields. The limitations of these criteria require that they be applied with judgment. Improved test equipment, instruments, and procedures are being developed to test the properties and trafficability of compacted snow. (Author)

AD-437 338 Div. 33
OTS price $3.60

National Aviation Facilities Experimental Center Atlantic City, N. J.
EVALUATION OF LIGHTED CROSSBARS AND LIGHTED RUNWAY DISTANCE MARKERS.
Final rept.,
by F. J. Meehan. Feb 64, 39p.
Proj. 432 1 5V
NAFEC RD64 27 Unclassified report

Descriptors: (*Marker lights, Runways), (*Runways, Marker lights), Landing aids, Take-off, Visbility, Paints.

Lighted crossbars extending accross the width of the runway spaced at 1000-foot intervals, and internally lighted frangible distance markers adjacent to the runway also spaced at 1000-foot intervals, were evaluated to determine a suitable system for providing runway distance-to-go information during takeoff and landing operations. Painted numerals, of the type developed and used in the United Kingdom, were also appraised. Flight testing was conducted in unlimited and restricted visibility conditions. Portions of the restricted visibility conditions were simulated using the Cockpit Fog Simulator and fixed density sheets of Mylar film to obtain a runway visual range (RVR) of approximately 1500 feet. It was determined that crossbars alone did not provide adequate distance-to-go information. Distance markers were not as effective as painted numerals under the lower visibility conditions. Crossbars when added to distance markers did not substantially improve the information obtained. High wind and engine blast effects caused marker damage. Numerals painted on the runway surface and located near the runway centerline were more effective than lighted runway-distance markers under the lower visibility conditions. It was recommended that the suitability of a combination of lighted runway-distance markers and numerals painted on the runway surface for providing distance-to-go information for civil aircraft operations be confirmed by an in-service test. (Author)

AD-437 786 Div. 33, 1
OTS price $6.60

Eclipse-Pioneer Div., Bendix Corp., Teterboro, N. J.
A STUDY OF THE EFFECTS OF LATERAL AUTOMATIC LANDING PERFORMANCE OF OVERFLIGHT INTERFERENCE WITH THE DIRECTIONAL WAVEGUIDE LOCALIZER. PHASE II.
Final rept.,
by J. Doniger. 15 Apr 63, 62p.
Contract FAA BRD451, Projs. FAA 114 13 1;
E P AD1091
Unclassified report

Descriptors: (*Ground-controlled approach radar, Doppler effect), (*Terminal flight facilities, Radar interference), Air traffic control systems, Aircraft, Interference, Waveguides, Automatic, Flight paths, Automatic pilots, Flight control systems, Analog computers, Flight, Noise (Radar), Jet transport planes, Damping, Equations, Motion, Jet fighters, Simulation, Radar beacons, Glide path systems.

The results of this study are based on analog computer simulations of various aircraft and control system combinations; and on the use of overflight interference data supplied by the Federal Aviation Agency. The results indicate that if the total interference duration is less than 40 seconds there is no objectionable effect on landing aircraft of the DC-7 or KC-135 type. This requires that interfering aircraft flying at less than 200 feet per second should be restricted to altitudes above 3000 feet when over the runway and within the ± 8 degree sector defined by the standard directional localizer. When the landing aircraft is of the TG 102 type the peak CDE deviations due to overflight interference should be less than ± 30 micron a. This is possible if the interfering aircraft is above 8000 feet and when the localizer transmitter is mounted 1/2 wavelength above ground. (Author)

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NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk are listed in the subject index.

BIBLIOGRAPHY

HW-68600 35
Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM ABSTRACTS. Volume 4, No. 1. 1 Feb 64, 32p
Contract AT(45-1)1350
OTS $0.50

HW-68600 36
Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM ABSTRACTS. Volume 4, No.2. 1 Mar 64, 11p
Contract AT(45-1)1350
OTS $0.50

AGRICULTURE

Plant Cultivation

BNL-6027
Brookhaven National Lab., Upton, N. Y.
STUDIES ON EFFECTS OF RADIATION ON MAIZE
Dale M. Steffensen. [18 Jun 62] 5p Prepared in cooperation with Univ. of Illinois
Contract AT(30-2)GEN-16
OTS $1.10

DESCRIPTORS: *Corn, *Gamma rays, *Genetics, *Mutations,

ASTRONOMY

Astrophysics

PB-165 278
California Univ., Berkeley.
COSMIC RAY GROUP. Final rept., 1 Oct 62-30 Sep 63
R. R. Brown. Mar 64, 7p
Grant AF-AFOSR-62-422
OTS $1.10

DESCRIPTORS: *Cosmic rays, Aurorae, Electron bombardment, X rays, *Atmospheric sounding, Meteorological balloons.

This report gives a summary of the following activities from October 1, 1962 to September 30, 1963: (1) Analysis of balloon data from the field program in Alaska the preceding summer months; (2) preparation of equipment for flight series from Pt. Barrow, Alaska in March 1963 and Ft. Wainwright and Ft. Yukon in September 1963; (3) flight programs at Pt. Barrow as well as Ft. Wainwright and Ft. Yukon; (4) calculations of ionospheric absorption effects due to solar protons and alpha particles; (5) analysis of optical emissions accompanying ionospheric absorption due to electron bombardment of the atmosphere; and (6) calculations of auroral electron spectra from balloon X-ray data, ionospheric absorption and optical emissions.

N64-17793
Florida State Univ., Tallahassee.
RADIO ASTRONOMY PROGRAMME. Status rept., 1 Aug 63-31 Jan 64
C. H. Barrow. [1964] 19p
Grant NsG-224-61
NASA CR-53301
OTS $1.60

DESCRIPTORS: *Radio astronomy.

N64-17593
Geophysics Corp. of America, Bedford, Mass.
A STUDY OF THE METEOROLOGY OF MARS AND VENUS. Quarterly progress rept. no. 4, 6 Oct 63-5 Feb 64
[1964] 25p
Contract NASw-704
NASA CR-53285
OTS $2.60

DESCRIPTORS: Meteorology, *Mars, *Venus, *Planetary atmospheres.

NASA-TR-R-169
367 800
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
SOLAR PROTON MANUAL
Frank B. McDonald, ed. Dec 63, 122p
N64-17889; includes N64-17890-17894
OTS $2.75

DESCRIPTORS: *Solar radiation, *Cosmic rays, Protons, Astrophysics.

N63-21433
Harvard Coll. Observatory, Cambridge, Mass.
THE METEOR POPULATION. Research rept. no. 3
Gerald S. Hawkins. Aug 63, 21p
Contract NASr-158
NASA CR-51365
OTS $2.60

DESCRIPTORS: *Meteors, Abundance,

N63-21432
Harvard Coll. Observatory, Cambridge, Mass.
THE PHYSICAL CHARACTERISTICS OF METEORS Research rept. no. 2
Richard B. Southworth and Gerald S. Hawkins. Jul 62, 29p
Contract NASr-158
NASA CR-51366
OTS $2.60

DESCRIPTORS: *Meteors, Physical properties

N63-21646
Harvard Coll. Observatory, Cambridge, Mass.
THE VELOCITY OF FAINT METEORS. Research rept. no. 1
Gerald S. Hawkins, Richard S. Southworth, and Bertil-Anders Lindblad. Jun 63, 15p
Contract NASr-158
NASA CR-51346
OTS $1.60

DESCRIPTORS: *Meteors, Velocity

N64-17592
Radioscience Lab., Stanford Univ., Calif.
RESEARCH AT THE STANFORD CENTER FOR RADAR ASTRONOMY. Semi-annual status rept. no. 2, 1 Jul-31 Dec 63
V. R. Eshleman. Feb 64, 9p
Grant NsG-377
NASA CR-53205
OTS $1.10

DESCRIPTORS: *Radio astronomy, *Radar

N64-17225
Rand Corp., Santa Monica, Calif.
ON GENERAL LEAST SQUARES ESTIMATION OF SOLAR SYSTEM CONSTANTS
R. T. Gabler and Albert Madansky. Feb 64, 54p
Contract NASr-21(04)
Memo no. RM-4019-NASA; NASA CR-53195
OTS $5.60

DESCRIPTORS: *Solar systems, Measurement, Standardization, *Least squares method.

N64-17818
Rensselaer Polytechnic Inst., Troy, N. Y.
CHEMISTRY OF THE ATMOSPHERE OF THE PLANET VENUS. Technical status rept. no. 3, 1 Aug 63-31 Jan 64
P. Harteck, R. R. Reeves, Jr., and Barbara A. Thompson. 1964, 4p
Grant NsG-261-62
NASA CR-53365
OTS $1.10

DESCRIPTORS: *Planetary atmospheres, Atmosphere, Planets, *Atmospheric refraction, *Venus.

BEHAVIORAL SCIENCES

AD-423 442
Aerospace Medical Research Labs. (6570th), Aerospace Medical Div., Wright-Patterson AFB, Ohio.
PSYCHOLOGICAL ASPECTS OF EXTENDED MANNED SPACE FLIGHT. Final rept., 1944-Apr 63, on Human Performance in Advanced Systems
Julien M. Christensen. Sep 63, 35p
AMRL-TDR-63-81; N64-12213
OTS $1.00

DESCRIPTORS: *Space flight, *Psychology, *Human engineering, *Training, Weightlessness, Mars, Performance (Human).

As is the case with virtually all of the other scientific disciplines, the adequacy of available psychological knowledge and principles will receive a severe test from the demands attendant to the development of a successful mission to Mars. A sampling of some of the relevant information available in psychology is offered and areas that will require further attention before predictions in the behavioral area for the Mars trip can be made with confidence are identified. A twofold thesis is developed. First, psychology has legitimate and important contributions to make to the Mars trip. Second, the advantages, however, are mutual; i.e., it is confidently predicted that participation in this venture will force psychologists to reexamine their traditional principles and theoretical positions and will stimulate an attack on the basic issues of human behavior with refreshing insights gained from new points of vantage. (Author)

AD-424 506
Aerospace Medical Research Labs. (6570th), Aerospace Medical Div., Wright-Patterson AFB, Ohio.
TROUBLESHOOTING STRATEGIES AND UTILITY FOR RISK. Rept. on Training, Personnel, and Psychological Stress Aspects of Bioastronautics
Kirk A. Johnson. Oct 63, 40p
AMRL-TDR-63-92; N64-12218
OTS $1.25

DESCRIPTORS: *Decision making, *Psychometrics, Probability.

Sixty-one subjects were administered a battery of tasks which consisted of: (a) a paper and pencil troubleshooting task, (b) a selective concept formation task, (c) 10 tasks designed to provide indexes of utility for risk, and (d) 4 tasks of quantitative intellectual ability. Both the troubleshooting and concept formation tasks were scored for: (a) premature attempts at final solutions, (b) totally redundant information seeking moves, and (c) the average expected reduction in uncertainty provided by moves other than those considered above. In spite of relatively high reliabilities, parallel indexes of problem-solving efficiency were almost completely independent of one another. The various indexes of utility for risk appeared to be almost completely independent of one another. No single index, whether of utility for risk or intellectual ability, accounted for more than 20% of the variability on any of the indexes of problem-solving efficiency. (Author)

AD-425 682
Electronic Systems Div., Fairchild Stratos Corp., Wyandanch, N. Y.
TRAINER ATTACHMENT, VISUAL SIMULATOR SMK 22/F37A-T. Rept. for 16 Oct 60-9 Jan 62, on Visual Flight Simulator Techniques
J. Heintzmam and T. S. Melrose. Oct 63, 42p
Contract AF33(600)42063
Rept. no. 93R-15; ASD-TDR-63-335
OTS $1.25

DESCRIPTORS: *Simulators, *Flight simulators, *Training devices, Vision, Runways, Training.

The Trainer Attachment, Visual Simulator, SMK-22/F37A-T when combined with a Flight Simulator provides training in low visibility landings and takeoffs. Specifically, the Visual Simulator provides a dynamic stimulation of the pattern of the runway and approach

lights which the pilot must use to guide the aircraft when transferring from instrument flight control to visual contact flight. Airport lighting with strobe lights, high intensity lights, and runway markers is simulated on a 30 foot neoprene conveyor belt moving in synchronism with aircraft speed. The pilot occupies his normal place in the flight simulator and performs instrument flight maneuvers in the standard manner. For landings it is assumed that the aircraft is flying under normal conditions; the initial phase of the approach (either precision radar or ILS) is under way, and the airplane is close to the desifed flight path and in the proper attitude. When the approach becomes "visual" the pilot views the simulated approach and runway lights in a closed circuit television monitor located in front of him and above the instrument panel. The television camera is synchronized with the roll, pitch, yaw, vertical, and lateral motions of the aircraft so that the television presentation and its motion relative to the stationary cockpit accurately simulates the appearance of a runway at night. Visual simulation begins at breakout and, provided that the aircraft stays close to the approach path, continues to touchdown and roll-out. (Author)

BIOLOGICAL SCIENCES

BNL-6936
Brookhaven National Lab., Upton, N. Y.
THE CONSERVATION OF PHYSICAL RESOURCES AS APPLIED TO THE ACTIVITIES OF PATIENTS WITH ARTHRITIS AND THE CONNECTIVE TISSUE DISEASES
Joy Cordery. [8 May 63] 62p
Contract AT(30-2)GEN-16
OTS $6.60

N64-15346
Naval School of Aviation Medicine, Pensacola, Fla.
EXPERIMENTS WITH DROSOPHILA MELANOGASTER IN MAGNETIC FIELDS
Perry Close and Dietrich E. Beischer. 1 Aug 62, 13p
NASA Order R-39
Proj. MR005.13-9010, R-7; NASA CR-55625
OTS $1.60

DESCRIPTORS: *Drosophilidae, *Magnetic fields, Genetics.

AD-427 169 repriced
New Hampshire Univ., Durham
RELATIONSHIP OF COLD UPON THE BIOLOGICAL PROPERTIES PECULIAR TO INFLUENZA VIRUS AND ITS CAPACITY FOR INVASIVENESS AND MULTIPLICATION
T. G. Metcalf. Aug 63, 8p
Contract AF41(657)350
AAL TN-62-12
OTS $0.50

DESCRIPTORS: *Influenza virus, *Escherichia coli, Reproduction (Physiology), Rodents, Excretion, Tissue culture, Enzymes, Dibasic acids, Amines, Mucin

Alaskan ground squirrels were examined for their excretion of animal and bacterial viruses. Eighty-one separate fecal samples from 25 animals yielded negative findings for bacterial viruses reactive against five strains of Escherichia coli. Sixty-six individual fecal samples from 24 animals failed to show the presence of animal viruses capable of causing cytopathogenic effects in HeLa, Human Amnion and the LLMK2 strain of monkey kidney monolayers. The significance of the findings for animal viruses is presented. Two successful ground squirrel breedings were accomplished with five baby squirrels produced in each litter. Neuraminidase activity of influenza virus was demonstrated at 25 C. The amount of neuraminic acid split from substrate by enzyme action at 25 C was less than that observed at 37 C. Ovomucin obtained from fresh hens eggs was prepared and shown capbale of serving as a suitable substrate for influenza neuraminidase. (Author)

Anatomy and Physiology

BNL-6031
Brookhaven National Lab., Upton, N. Y.
PROCEDURES FOR THE STUDY OF BILE PHYSIOLOGY IN THE RAT
P. S. Papavasiliou, A. J. Bertinchamps, S. T. Miller, J. Guilibon, and G. C. Cotzias. [18 Jun 62] 9p
Contract AT(30-2)GEN-16
OTS $1.10

N64-17766
Electronics Research Labs., Columbia Univ., N. Y.
METHODS FOR DETERMINING BLOOD FLOW THROUGH INTACT VESSELS OF EXPERIMENTAL ANIMALS UNDER CONDITIONS OF GRAVITATIONAL STRESS AND IN EXTRA-TERRESTRIAL SPACE CAPSULES. Status rept. P-3/168, 1 Aug 62-31 Jan 63
Robert Feldstein, James M. Kennedy, Louis B. Lambert Albert F. Sciorra and Robert F. Shaw. 1 Aug 63, 137p
Grant NsG-112-61
CU-3-63-NASA-112-ERL; NASA CR-53302
OTS $10.50

DESCRIPTORS: *Space medicine, *Blood circulation, Laboratory animals.

AD-424 409
Institute of Occupational Health, Helsinki (Finland).
EFFECTS OF EXPOSURES TO EXTREMELY HOT ENVIRONMENTS ON TEMPERATURES OF THE TYMPANIC MEMBRANE, THE OESOPHAGUS, AND THE RECTUM OF MEN. Rept. for Nov 61-Dec 62, on Biomedical Criteria for Aerospace Flight Pekka Piironen. Oct 63, 52p
Grant AF EOAR 62-31
AMRL-TDR-63-85; N64-12215
OTS $1.50

DESCRIPTORS: *Exposure, Acclimatization, Man, Atmospheric temperature, Heat, *Heat tolerance, *Body temperature, Vestibular apparatus, *Esophagus, Membranes (Biology), Gastrointestinal system, Tolerances (Physiology).

The oesophageal, tympanic, and rectal temperatures of resting nude human subjects were investigated in extremely hot thermal environments ranging from 50° to 130° C (120° to 265° F). Changes in temperatures in temperatures in the oesophagus and at the tympanic membrane appeared rapidly, were linear, and were of equal magnitude. They were considered to follow closely the blood temperature in the central circulation. The simultaneous changes in the rectal temperature were slow and irregular. (Author)

AD-424 396
Institute of Occupational Health, Helsinki (Finland).
THERMAL EXCHANGES OF THE HUMAN BODY IN EXTREME HEAT. Rept. for Nov 61-Dec 62, on Biomedical Criteria for Aerospace Flight
Erkki Aikas and Pekka Piironen. Oct 63, 51p
Grant AF EOAR 62-31
AMRL-TDR-63-86; N64-12216
OTS $1.50

DESCRIPTORS: *Heat transfer, *Thermal radiation, Respiration, Temperature, Humans, Space medicine, *Body temperature.

Seven nude men were exposed supine to various environmental temperatures ranging from 50° to 130° C (120° to 265° F). The respiratory heat exchange, the metabolic heat production, the change in the body heat content, and the coefficient for evaporative heat transfer were determined. The radiating surface area and coefficient for convective heat transfer were calculated by using the method of partitional calorimetry. The mean values obtained for the coefficients of evaporation and convection were $11.3\sqrt{v}$ kcal/m^2 h mm Hg and $6.8\sqrt{v}$ kcal/m^2 h °C (v in m/s), respectively. The radiation area factor determined was 0.49. (Author)

AD-424 541
John B. Pierce Foundation of Connecticut, Inc., New Haven.
REDUCED SET POINT TEMPERATURE IN EXERCISING DOG. Rept. for Oct 61-May 63, on Biophysics of Flight Donald C. Jackson and Harold T. Hammel.
Doctoral thesis. Oct 63, 20p
Contract AF33(657)7603
AMRL-TDR-63-93; N64-12219
OTS $0.50

DESCRIPTORS: *Dogs, *Body temperature, *Exercise, Evaporation.

Experiments were performed on dogs to test the hypothesis of an elevated set point temperature in exercise. Measurements of rectal, hypothalamic, and skin temperatures and respiratory evaporative heat loss were made on dogs at rest and during exercise on a level treadmill at 4 mph. Local hypothalamic heating and cooling during exercise, using surgically implanted thermodes, were performed on two dogs to confirm the temperature sensitivity of the hypothalamus of the exercising dog. Comparisons of evaporative heat loss during rest and exercise revealed much greater loss during exercise than at rest at the same hypothalamic temperatures. In experiments at low ambient temperatures, between 10°C and 17°C, internal body temperatures were often the same or lower during exercise than during the preceding rest period, although panting and vasodilation were observed during exercise in contrast to shivering and vasoconstriction during the rest period. These observations lead to the conclusion that the set point temperature in trained, exercising dogs is lowered from the resting level. (Author)

AD-427 202 repriced
Johns Hopkins Univ., Baltimore, Md.
THE EFFECT OF COLD ON SOME ASPECTS OF PROTEIN METABOLISM
Bacon F. Chow. Aug 63, 10p
Contract AF41(657)299
AAL TN-62-11
OTS $0.50

DESCRIPTORS: *Proteins, *Metabolism, Rats, Adaptation (Physiology), Temperature, Urine, Excretion, Nitrogen, Diet, Corticosteroid agents,

Studies were made to determine (1) the effect of a protein-free diet on the urinary excretion of nitrogen, (2) the nitrogen distribution in the urine of rats kept at different temperatures, and (3) the effect of administration of cortisone on the urinary excretion of nitrogen. With a protein-free diet, the excretion of urinary nitrogen increased when the rats were placed at low temperatures. Further experimentation indicated that catabolism at decreased temperatures is independent of increased caloric requirement. It was found that at lower temperatures about 9% of the total N excreted was in the form of protein, and that this protein is distinct from serum albumin. Cortisone was found to have no effect on the urinary excretion of nitrogen.

Biochemistry

BNL-6255
Brookhaven National Lab., Upton, N. Y.
THE EFFECTIVE RIBOSOMEL UNIT IN PROTEIN SYNTHESIS [4 Sep 62] 8p
Contract AT(30-2)GEN-16
OTS $1.10

AD-423 528
Farr Cytochemical Labs., Camden, Maine
RESEARCH ON THE CYTOCHEMISTRY OF MICROORGANISMS. Final rept., Feb 62-Feb 63, on Space Biology Research
Wanda K. Farr. Aug 63, 51p
Contract AF33(616)7891
AMRL-TDR-63-72; N64-11461
OTS $1.50

DESCRIPTORS: *Algae, *Fungi, *Cytochemistry, *Pectins, *Proteins, Microorganisms, Food.

As a part of the research program designed to solve the nutritional problems of astronauts during extended explorations of space, the following experiments were conducted. Cell wall substances in the alga, Chlorella pyrenoidosa 71105, and the fungus, Linderina pennispora NRRL 2237, were identified and localized by means of standard cytochemical techniques. Pectic material in the primary lamella and cellulose in the secondary lamella were found in the wall of C. pyrenoidosa. The walls of the cells of L. pennispora were chitinous, with no indication of the presence of cellulose at any stage of development. The pectic material in the wall of the alga was in the form of a pectic-protein complex and the chitin in the walls of the fungal cells was in the form of a chitin-protein complex. The wall of C. pyrenoidosa reacted positively to an enzyme mixture of pectinase and cellulase and the walls of L. pennispora reacted similarly to chitinase. These identifications and reactions to enzymes can be used in the effort to bring about total assimilation of cell wall substances if these algal and fungal cells should be chosen as food materials in meeting the nutritional requirements of the space program. (Author)

AD-421 904
Naval Research Lab., Washington, D. C.
SOME FACTORS AFFECTING THE OXYGEN PRODUCTION BY ALGAE IN A SMALL CULTURE UNIT. Interim rept.
R. L. Shuler. 12 Sep 63, 13p
NRL rept. 5979; N64-10557
OTS $0.50

DESCRIPTORS: *Algae, *Oxygen, Culture media, Light, Nitrogen, Photosynthesis, Submarines, Atmosphere, Carbon dioxide, *Life support.

The performance of an algal culture unit having a 3/4-inch annular culture chamber was evaluated in terms of its oxygen-producing capabilities. The oxygen production of cultures containing 0.5, 0.6, 0.7, and 1.0 percent of cells was determined at several light intensities. For a given light intensity, the rate of oxygen output was essentially the same for each cell density, indicating that all the cultures were in the linear phase of growth. The experimental results led to the conclusion that, for cultures in the linear phase of growth, the rate of oxygen evolution is a logarithmic function of light intensity. At the highest light intensity used, 17,000 foot-candles, the rate of oxygen output was approximately 385 cc/hr/liter of suspension. In these studies both urea and nitrate were used as nitrogen sources. Higher growth rates were obtained when urea was used, but more oxygen was produced by nitrate-grown cultures. In addition, the average photosynthetic quotient (O_2/CO_2) was significantly higher for nitrate cultures. These observations can be explained by assuming that the chlorophyll in the cells photochemically reduces the nitrate, releasing oxygen in the process (Hill reaction). A preliminary study concerning the nutrient requirements of the cells has shown that the nitrogen source is the first culture nutrient to be depleted. (Author) (See also AD-268 833)

Medical Specialties and Equipment

AD-423 132
Aerojet-General Corp., Azusa, Calif.
A STUDY OF THE EFFECTS OF LONG-TERM INGESTION OF RECOVERED WATER: HUMAN INGESTION TRIALS. Final rept., Nov 61-Apr 63, on Space Biology Research
D. deSteiguer and A. T. Pessa. Oct 63, 26p
Contract AF33(616)8196
Rept. no. 2541; AMRL-TDR-63-70
OTS $0.75

DESCRIPTORS: *Humans, *Space biology, *Water, *Urine, Consumption, Closed ecological systems, Recovery, Distillation.

The work was conducted to obtain subjective responses to recycled water recovered from urine, laboratory data on the recovery procedures, and clinical data to indicate any pathophysiological effects. Four male human volunteers participated; an 8-week control period, during which a minimum of 1500 cc of distilled water was consumed each day, was followed by an 8-week experimental period, during which 1500 cc/day of distillate was to be consumed. A still of standard laboratory glassware was constructed to permit recovery of large percentages of human urine. Chemical analyses indicated that the distillate conformed to water standards established by the U. S. Public Health Service. The clinical examinations included cephalin-flocculation and thymol-turbidity tests, complete blood counts, and urinalyses. None of the subjects demonstrated psychologic or physiologic symptomatology; in addition, there were no significant physical findings, and the laboratory data were unremarkable. Slightly increased intake and urine output noted for the experimental period, in comparison with the control period, were probably due to variations in levels of activity, diet, and climatic conditions. (Author)

AD-425 574
Aerospace Medical Research Labs. (6570th), Aerospace Medical Div., Wright-Patterson AFB, Ohio.
RESEARCH AND DEVELOPMENT ON PULSE-MODULATED, PERSONAL-TELEMETRY SYSTEMS. Final rept. for Jan 61-Jul 63, on Biophysics of Flight
Adolf R. Marko, M. A. McLennan, E. G. Correll, George Potor, and J. M. Gibson. Oct 63, 23p
AMRL-TDR-63-96; N64-13654; N64-13804
OTS $0.75

DESCRIPTORS: *Pulse modulation, *Telemeter systems, Design, Monitors, Physiology, Performance (Human), *Space medicine, Biophysics, *Medical equipment.

The research and development undertaken on pulse-position and pulse-duration modulation for application in personal-telemetry systems resulted in an improved three-channel, pulse-position, amplitude-modulation-telemetry system with frequency modulation in the FM band. Further experimentation resulted in a seven-channel laboratory model using pulse-duration modulation. The seven-channel equipment allows the monitoring of the electroencephalogram, two leads of electrocardiogram, galvanic-skin resistance (base resistance and specific response), respiration and body temperature, at a distance up to 300 feet. High baseline and amplitude stability are combined with low-power consumption. New microelectronic components make it feasible to reduce the size of the seven-channel transmitting unit to 3 1/2 by 2 1/4 by 1 inch, and the weight to about 200 grams, without sacrificing performance. Tape recording of the received signal does not require expensive instrumentation recorders. A portable receiving and recording unit in a small suitcase simplifies the application for field experiments. (Author)

N64-17788
Naval School of Aviation Medicine, Pensacola, Fla.
INSTRUMENTATION FOR THE PENSACOLA CENTRIFUGE-SLOW ROTATION ROOM I FACILITY
W. Carroll Hixson. 17 Oct 63, 26p
NASA Order R-37
Proj. MR005.13-6001, R-88; NASA CR-53341
OTS $2.60

DESCRIPTORS: *Centrifuges, *Test facilities, *Aviation medicine.

Pharmacology and Toxicology

BNL-6172
Brookhaven National Lab., Upton, N. Y.
ACUTE INTRAVENOUS AND INTRAPERITONEAL TOXICITY STUDIES ON SODIUM PENTABORATE DECAHYDRATE AND SODIUM TETRABORATE DECAHYDRATE
Otho D. Easterday and Helen Hamel. 19 Jun 62, 28p
Contract AT(30-2)GEN-16
OTS $2.60

AD-422 266
Texas A. and M. [Univ.] College Station.
ENVIRONMENTAL POLLUTION BY MISSILE PROPELLANTS. Final rept., Jan-Nov 62, on Toxic Hazards of Propellants and Materials
Walter W. Heck, Morris E. Bloodworth, William J. Clark, Dale R. Darling, and William Hoover. Aug 63, 88p
Contract AF33(616)7801
AMRL-TDR-63-75; N63-23574
OTS $2.25

DESCRIPTORS: Guided missiles, *Propellants, *Toxicity, Contamination, Plants (Botany), Soils, Aquatic animals, Hydrazine, Pyridines, Boranes, Nitronium perchlorate, Air pollution.

Experimental procedures were developed to study the effects of hydrazine, unsymmetrical dimethylhydrazine (UDMH), pyridine borane, and nitronium perchlorate on plant growth and development, soil and soil structure, and aquatic organisms. Plant growth and development research included: seed germination, seed growth, and treatment of plants in water culture, by sprays, and with the test chemicals as air pollutants. Under the conditions used in this study, the four chemicals do not appear to be important environmental contaminants in relation to plant growth and development. Both UDMH and hydrazine are strongly adsorbed or decomposed on clay particles. Montmorillonite and kaolinite clays, as well as the test soils, seem to accelerate the decomposition of the UDMH and hydrazine. Pyridine borane was adsorbed on the test soils but apparently was not adsorbed on the pure clays. The aquatic life was very sensitive to the three organic compounds and to some extent to the perchlorate ion. (See also AD-282 984)

Radiobiology

ANL-6790
Argonne National Lab., Ill.
BIOLOGICAL AND MEDICAL RESEARCH DIVISION SEMIANNUAL REPORT, JULY-DECEMBER 1962.
Oct 63, 237p
Contract W31-109-eng-38
OTS $3.00

TID-16572
Argonne National Lab., Ill.
A COMPARISON OF RADIATION INDUCED GRANULOCYTOPENIA IN SEVERAL MAMMALIAN SPECIES
Harvey M. Patt and Mary A. Maloney. [Jun 62] 11p
Contract W31-109-eng-38
UAC-6501
OTS $1.60

DESCRIPTORS: *Blood diseases, *Radiation sickness, Hematology, Mammals, X rays.

TID-16185
Argonne National Lab., Ill.
PATTERNS OF RADIUM RETENTION IN MICE AS RELATED TO MAN
Asher J. Finkel and Charles E. Miller. [May 62] 7p
Contract W31-109-eng-38
UAC-6443
OTS $1.10

DESCRIPTORS: *Radium, Retention, *Mice,

BNL-6253
Brookhaven National Lab., Upton, N. Y.
EXTRACORPOREAL IRRADIATION OF BLOOD: MATHEMATICAL CONSIDERATIONS OF THE RADIATION DOSE DELIVERED TO A LIQUID BEING PUMPED THROUGH A RADIATION FIELD FROM AND BACK TO A RESERVOIR
Daniel Slatkin, C. R. Jansen, and E. P. Cronkite. [Sep 62] 15p
Contract AT(30-2)GEN-16
OTS $1.60

DESCRIPTORS: *Blood circulation, *Radiation effects, *Radiological dosage, Blood,

BNL-6280
Brookhaven National Lab., Upton, N. Y.
OBSERVATIONS OF NUCLEAR RNA DURING MITOSIS IN HUMAN CANCER CELLS IN CULTURE (HeLa-S_3), STUDIED WITH TRITIATED CYTIDINE
L. E. Feinendegen and V. P. Bond. 1962, 22p
Contract AT(30-2)GEN-16
OTS $2.60

BNL-6252
Brookhaven National Lab., Upton, N. Y.
PLASMA CLEARANCE AND WHOLE BODY TURNOVER OF INJECTED AND ABSORBED RADIO-VITAMIN B_{12} IN MAN
Peter Reizenstein, Eugene P. Cronkite, and Stanton A. Cohn. [4 Sep 62] 16p
Contract AT(30-2)GEN-16
OTS $1.60

HW-SA-2280
Hanford Atomic Products Operation, Richland, Wash.
THE EFFECTS OF X-IRRADIATION ON THE PERMEABILITY OF YEAST
R. T. O'Brien and F. P. Hungate. [Nov 61] 19p
Contract AT(45-1)1350
OTS $1.60

DESCRIPTORS: *Yeasts, Radiation effects, *X rays.

LADC-5454
Los Alamos Scientific Lab., N. Mex.
DETERMINATION OF ABSORBABILITY OF ORAL RADIOIRON IN HEALTH AND DISEASE IN MAN BY WHOLE-BODY SCINTILLOMETRY
C. C. Lushbaugh and D. B. Hale. [13 May 63] 25p
Contract W7405-eng-36
OTS $2.60

TID-18627
Roswell Park Memorial Inst., Buffalo, N. Y.
THE ROLE OF SERUM ERYTHROPOIETIC FACTOR IN ANEMIA OF MALIGNANCY. Progress rept.
Theodore C. Prentice. 15 Jun 55, 22p
Contract AT(30-1)1829
OTS $2.60

DESCRIPTORS: Primates, *Erythrocytes, *Infections, Blood, Urine,

DPSPU-63-30-3
Savannah River Lab., Aiken, S. C.
UPTAKE OF RADIONUCLIDES BY FRESH WATER ALGAE AND FISH
R. S. Harvey. May 63, 11p
Contract AT(07-2)1
OTS $1.60

DESCRIPTORS: Zinc, Strontium, Cesium, Isotopes, *Algae, *Fishes, *Health physics.

TID-18713
Union Carbide Nuclear Co., Oak Ridge, Tenn.
AN ANALYSIS OF CESIUM BODY BURDENS
L. M. Scott. [5 Jun 63] 14p
Contract W7405-eng-26
OTS $1.60

DESCRIPTORS: *Cesium, *Isotopes, Man, *Radiobiology.

TID-17837
Yerkes Labs. of Primate Biology, Inc., Orange Park, Fla.
EFFECTS OF IONIZING RADIATION IN CHIMPANZEES. Final rept., 28 Feb-31 Oct 62.
Arthur J. Riopelle and Charles M. Rogers. [1962] 33p
Contract AT(1441)1553
OTS $3.60

DESCRIPTORS: *Chimpanzees, *Radiation effects, Gamma rays.

CHEMISTRY

CONF-126-1
Argonne National Lab., Ill.
FLUORIDES OF XENON, PREPARATION AND PROPERTIES
Cedriv L. Chernick. [1963] 9p
Contract W31-109-eng-38
OTS $1.10

DESCRIPTORS: *Xenon, *Fluorides, Bibliographies

Conference on Noble Gas Compounds, Argonne, Ill., Apr 63

TID-16263
Argonne National Lab., Ill.
SOME INFLUENCES DETERMINING COORDINATION NUMBER OF CATIONS
Leonard I. Katzin. May 62, 6p
Contract W31-109-eng-38
UAC-6462
OTS $1.10

DESCRIPTORS: *Ions

BNL-6315
Brookhaven National Lab., Upton, N. Y.
INVESTIGATIONS ON THE ALKALOID CONTENT OF NICOTIANA SPECIES AND INTERSPECIFIC COMBINATIONS
Harold H. Smith and Dorothy V. Abashian. [Oct 62] 36p
Contract AT(30-2)GEN-16
OTS $3.60

TID-19258
California Univ., Riverside.
A COMPARISON OF EXCITON AND MOLECULAR ORBITAL CALCULATIONS ON n TRANSITIONS
David R. Kearns and M. Ashraf El-Bayoumi (Alexandria Univ., [1962] 32p
Contract AT(11-1)952
OTS $3.60

DESCRIPTORS: *Pyridines, *Aromatic compounds, *Nitrogen compounds, Excitation.

SC-RR-64-67
Callery Chemical Co., Pa.
THERMODYNAMIC PROPERTIES OF THE METAL BROMIDES, IODIDES, SULFIDES, SULFATES, CHROMATES, METAPHOSPHATES, ORTHOPHOSPHATES, MOLYBDATES, TUNGSTATES, BORATES AND HYDROXIDES. Final rept. for May-Dec 63.
W. J. Cooper and D. A. Scarpiello. Jan 64, 56p
OTS $1.25

RFP-286
Dow Chemical Co., Denver, Colo.
INTERLABORATORY COMPARISONS WITH HI-LO-RANGE CHARTS
Jack A. Schulz. [10 Oct 62] 14p
OTS $1.60

TID-18705
Georgie Inst. of Tech., Atlanta Engineering Experiment Station.
IONIZATION AND CHARGE TRANSFER CROSS SECTIONS. Technical status rept. no. 14 (Annual summary rept.) 1 Mar 62-28 Feb 63.
D. W. Martin, D. S. Harmer, and R. A. Langley. 1 Mar 63, 30p
Contract AT(40-1)2591
OTS $2.60

DESCRIPTORS: *Helium, *Ions, Protons, *Gas ionization

AD-424 580
Harry Diamond Labs., Washington, D. C.
HYDROGEN SOURCES FOR FUEL CELLS
David Singman and A. F. Forziati. 1 Nov 63, 23p
Rept. no. TR-1168; N64-12661
OTS $0.75

DESCRIPTORS: *Batteries and components, *Fuel cells, *Hydrogen, Production, *Gas-generating systems, Storage, *Gas cylinders, *Cryogenics, Bibliographies.

Commercially available gas, liquid, and chemical sources of hydrogen for use with fuel-cell batteries are compared. Cryogenic storage is shown to be the most efficient on both weight and volume bases. Chemical generators are suitable for applications requiring moderate quantities of hydrogen gas at infrequent periods. Compressed-gas cylinders are convenient when small quantities of hydrogen are desired. A bibliography of selected publications during the past five years is included. (Author)

TID-18644
Hughes Research Labs., Malibu, Calif.
STUDIES OF H_2^+ DISSOCIATION, PHASE III. Quarterly progress rept. no. 2, 15 Feb-14 May 63
A. W. Ehler. 12 May 63, 7p
Contract AT(04-3)362
OTS $1.10

DESCRIPTORS: *Hydrogen, *Ions, Dissociation

TID-16092
Knolls Atomic Power Lab., Schenectady, N. Y.
CHEMICAL ANALYSIS OF STAINLESS STEEL CORROSION PRODUCTS
J. R. Ciaranello and K. E. Combs. 28 Jun 62, 3p
Contract W31-109-eng-52
OTS $1.10

DESCRIPTORS: *Stainless steel, *Corrosion, *Colorimetric analysis

UCRL-10725
Lawrence Radiation Lab., Univ. of California, Berkeley.
THE EXCHANGE OF CN WITH $Cr(NO)(CN)^{-3}$ AS FOLLOWED BY ELECTRON SPIN RESONANCE
J. Brock Spencer and Rollie J. Myers. 31 Mar 63, 6p
Contract W7405-eng-48
OTS $1.10

UCRL-7042-T
Lawrence Radiation Lab., Univ. of California, Livermore.
ESTIMATED CRITICAL CONSTANTS FOR SiH_4, GeH_4, AND AsH_3
David G. Edwards. [17 Sep 62] 3p
Contract W7405-eng-48
OTS $1.10

LA-3049
Los Alamos Scientific Lab., N. Mex.
THE GRAVIMETRIC DETERMINATION OF TRACE AMOUNTS OF HYDROGEN IN SODIUM METAL
Ross D. Gardner and William H. Ashley. Feb 64, 12p
Contract W7405-eng-36
N64-18003
OTS $0.50

TID-18635
Michigan Univ., Ann Arbor.
THERMAL STUDIES OF THE PLASTIC CRYSTAL TRANSITION IN SUCCINONITRILE
Claus A. Wulff and Edgar F. Westrum, Jr. [May 63] 17p
Contract AT(11-1)1149
OTS $1.60

DESCRIPTORS: *Crystals, Transition temperature.

CONF-154-1
Oak Ridge Gaseous Diffusion Plant, Tenn.
VISCOSITY OF CONCENTRATED SUSPENSIONS OF SPHERICAL PARTICLES
Harold L. Weissberg and Stephen Prager (Univ. of Minnesota) [1963] 3p
Contract W7405-eng-26
OTS $1.10

DESCRIPTORS: *Viscosity

Fourth International Congress of Rheology, Providence, R. I., Aug 63

IDO-16912
Phillips Petroleum Co., Bartlesville, Okla.
POLYPHENYL ANALYSIS
P. W. Solomon. 31 Mar 64, 144p
Contract AT(10-1)1080
N64-17839
OTS $2.50

NYO-9047
Radiation Applications Inc., Long Island City, N. Y.
DIFFUSION OF KRYPTON THROUGH URANIUM CARBIDE. Final rept. 10 Jan 61, 22p
Contract AT(30-1)2497
EURAEC-19
OTS $2.60

DESCRIPTORS: *Krypton, Refractory materials, *Uranium, *Carbides, *Diffusion,

NYO-9697
Rensselaer Polytechnic Inst., Troy, N. Y.
COBALT (II) HALIDES AS ELECTROLYTES IN ACETONITRILE Technical rept. no. 9.
George J. Janz, Arthur E. Marcinkowsky, and H. V. Venkatasetty. Apr 62, 21p
Contract AT(30-1)1999
OTS $2.60

AD-425 811
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE DETERMINATION OF TRACE AMOUNTS OF BORON IN MOLYBDENUM. Rept. for Jun 62-Jul 63, on The Chemistry and Physics of Materials
K. F. Sugawara. Nov 63, 16p
RTD-TDR-63-4082; N64-12578
OTS $0.50

DESCRIPTORS: *Molybdenum, *Boron, Chemical analysis, Spectrophotometers, Mechanical properties, Distillation, Sensitivity,

A reliable method was established for the determination of 1 to 25 micrograms of boron in molybdenum. Dissolution of the metal is effected with fusion mixture of sodium carbonate and sodium nitrate. The boron is selectively separated by distillation and then determined spectrophotometrically, using carminic acid reagent. In addition, a study was completed to determine the most efficient manner in which the distillation can be accomplished. The sensitivity is approximately 20 parts per million boron in molybdenum, but the sensitivity can be extended by using larger samples. (Author)

TID-16869
Savannah River Lab., Aiken, S. C.
THE KINETICS OF THE REACTION BETWEEN SULFUROUS ACID AND FERRIC ION
D. G. Karraker. [15 Oct 62] 17p
Contract AT(07-2)1
OTS $1.60

N64-17598
Warner and Swasey Co., Flushing, N. Y.
ANALYSIS OF HIGH TEMPERATURE GASES IN SITU BY MEANS OF INFRARED BAND MODELS
Gunter J. Penzias and G. Jordan Maclay. 15 Dec 63, 45p
Contract NAS3-1542, phase 3
W&S TR-28; NASA CR-54002
OTS $4.60

DESCRIPTORS: *Gas analysis, *Infrared spectroscopy, Combustion.

WCAP-1570
Westinghouse Electric Corp., Pittsburgh, Pa.
LITERATURE VALUES FOR SELECTED CHEMICAL/PHYSICAL PROPERTIES OF AQUEOUS BORIC ACID SOLUTIONS
D. E. Byrnes and W. E. Forster. Jan 61, 23p
Contract AT(30-1)3064
OTS $2.60

DESCRIPTORS: *Boric acids, Chemical properties, Physical properties.

Physical Chemistry

N64-17494
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DEGRADATION OF HOMOGENEOUS POLYMERIC MATERIALS EXPOSED TO HIGH HEAT FLUXES
Robert G. Nagler. 1 Feb 64, 30p
Contract NAS7-100
Technical rept. no. 32-527; NASA CR-53256
OTS $2.60

DESCRIPTORS: *Polymers, Materials, *Degradation, High-temperature research.

AD-424-180
Oklahoma State Univ. Research Foundation, Stillwater.
MOLECULAR FLOW AND THE EFFUSION PROCESS IN THE MEASUREMENT OF VAPOR PRESSURES. Interim rept., 1 Jun 62-31 May 63, on The Chemistry and Physics of Materials
Robert D. Freeman. Aug 63, 103p
Contract AF33(657)8767
ASD-TDR-63-754, Part I
OTS $2.50

DESCRIPTORS: *Vapor pressure, *Superaerodynamics, *Gas flow, Mathematical analysis, Orifices.

Transmission probabilities, angular distribution functions, and recoil force corrections were computed for cylindrical and conical orifices. The results for cylindrical orifices are in very good agreement with previous computations and for the recoil force factor, represent an improvement over previous computations. An unexpected result of the computations is that the recoil force correction factor F can exceed unity for certain orifice parameters. The design and construction of an apparatus for the experimental study of angular distribution of molecules which effuse from non-ideal orifices is described. Preliminary results are presented for the Multicell Technique for experimental evaluation of transmission probabilities; the results agree with theoretical values within ± 2 per cent. The Electrodynamometer Momentum Detector was tested; with it torques in the range 0.05 to 0.5 dyne-cm can be measured with a precision of ± 0.2 per cent and an accuracy of ± 0.2-0.5 per cent. A new technique, the Microbalance-Inverted Knudsen Effusion-Recoil (MIKER) Technique, for the measurement of vapor pressures in the range 10^{-4} to 10^{-7} atm and of molecular weights of vapors is discussed and the apparatus, especially the microbalance, which was designed and constructed for its realization is described. (Author)

AD-423 846
Research and Technology Div., Air Force Systems Command Wright-Patterson AFB, Ohio.
EFFECTIVE SHIELDING VALUES OF THE PHENYL GROUP IN SOME GROUP IVb AND Vb COMPOUNDS. Final rept., Oct 62-Jun 63, on Material Analysis and Evaluation Techniques, and Non-Metallic and Composite Materials
M. T. Ryan and W. L. Lehn. Oct 63, 14p
ASD-TDR-63-832; N64-12229
OTS $0.50

DESCRIPTORS: *Silanes, *Amines, *Phosphines, Arsenic compounds, *Metalorganic compounds, Aromatic compounds, Germanium compounds, Tin compounds, *Nuclear magnetic resonance, Group IV elements, Group V elements.

The effective shielding values of the phenyl group in silanes, germanes, stannanes, amines, phosphines and arsines are calculated from the proton magnetic resonance frequencies of protons attached to the group IVb or Vb element. The effective shielding of the phenyl group appears to be dependent on the electronegativity of the element to which it is bonded. The application of an additivity rule in calculating the frequency of protons in substituted silanes is shown. (Author)

AD-423 525
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRON SPIN RESONANCE (ESR) STUDY OF GAMMA IRRADIATED SOLID ACETONITRILE. Rept. for Jan-Jun 63, on Research and Characterization and Properties of Materials
L. A. Harrah, R. E. Rondeau, S. Zakanycz, D. Hale, and D. Dunbar. Sep 63, 27p
ASD-TDR-63-785; N64-11924
OTS $0.75

DESCRIPTORS: *Nitriles, *Radiation chemistry, Spectroscopy, *Magnetic resonance, Mass spectroscopy, Chromatographic analysis, *Free radicals, Hydrogen, Methane, Chemical reactions

The solid phase Cobalt-60 radiolysis of acetonitrile was investigated. Free radicals produced during the exposure to gamma rays were studied with an electron-spin resonance spectrometer and the final products were determined by gas chromatography and mass spectrometry. Predominant products are hydrogen, methane, and succinonitrile. The reaction paths to these products are inferred from, and consistent with, the ESR spectra of the trapped free radicals. (Author)

AD-423 856
Stanford Research Inst., Menlo Park, Calif.
THE ROLE OF IONS IN THE RADIOLYSIS OF ORGANIC LIQUIDS. Rept. for 1 Mar 62-31 Aug 63, on The Chemistry and Physics of Materials
A. H. Samuels, M. A. Golub, and J. Danon. Nov 63, 51p
Contract AF33(657)8205
RTD-TDR-63-4133
OTS $1.50

DESCRIPTORS: *Radiation chemistry, Chemical reactions, Ions, Tin compounds, Aromatic compounds, Chlorides, Alkenes, Polymers, *Isoprene, *Molecular isomerism.

Irradiation to $3x10^{21}$ ev/g of solutions of stannic chloride ($SnCl_4$) in toluene at 195°K by 1-Mev electrons gave o- and m- and/or p-chlorotoluene yields (G, molecules/100 ev) which were unaffected by changes in temperature and dose and by the presence of ethylene and nitric oxide, but rose with $SnCl_4$ concentration to approach a limiting total value near 0.2. When ethylene was present, G(total C_9H_{12}) was near 0.01. When CCl_4 was substituted for $SnCl_4$, a different product pattern was found. Squalene was irradiated with Co^{60} γ-rays at room temperature and with 1-Mev electrons at 243°K. The main radiation-induced effects, with their G-values at room temperature, are loss of unsaturation (4.6), crosslinking (1.35), trans-cis isomerization (0.83), and hydrogen evolution (0.58). Most of the loss of unsaturation is attributed to cyclization; it occurs only in the crosslinked fraction. Increased yields (on the basis of energy absorbed in the solute) were observed for the cis-trans isomerization of squalene and cis- and trans-polyisoprene when these were irradiated in benzene solution. The chlorination of toluene and the cyclization of cross-linked squalene are believed to have ionic intermediates. (Author)

EARTH SCIENCES

Geodesy

N64-17578
Electrical Engineering Research Lab., Univ. of Illinois, Urbana.
A FORTRAN COMPUTER PROGRAM FOR DETERMINING THE EARTH'S MAGNETIC FIELD
Richard H. Eckhouse, Jr. 1 Feb 64, 21p
Grant NsG-24-59
NASA-CR-53176
OTS $2.60

DESCRIPTORS: *Programming languages, Determination, *Terrestrial magnetism,

Geology

TID-16599
Argonne National Lab., Ill.
ABUNDANCES OF RUTHENIUM, OSMIUM AND URANIUM IN SOME COSMIC AND TERRESTRIAL SOURCES
George L. Bate and J. R. Huizenga. 29 Jun 62, 34p
Contract W31-109-eng-38
UAC-6583
OTS $3.60

DESCRIPTORS: *Radioactivation analysis, Geochemistry, *Meteorites, *Ruthenium, *Osmium, *Uranium,

Oceanography

HW-73707
Hanford Atomic Products Operation, Richland, Wash.
ARTIFICIAL COOLING OF THE COLUMBIA RIVER BY DAM REGULATION 1961
H. A. Kramer. 15 Jun 62, 72p
Contract AT(45-1)1350
OTS $7.60

USNRDL-TR-637
Naval Radiological Defense Lab., San Francisco, Calif.
A METHOD FOR THE COLLECTION, STORAGE, AND MONITORING ANALYSIS OF NATURAL SEA WATER
H. Goya, P. Zigman, M. Lai, and J. Mackin.
27 Feb 63, 28p
Contract AT(49-5)2084
OTS $2.60

DESCRIPTORS: *Sea water, Analysis,

Physics of the Atmosphere

NASA-TN-D-2249
Johns Hopkins U., Baltimore, Md.
AN OBSERVATION OF THE (O, O) NEGATIVE BAND OF N_2^+ IN THE DAYGLOW
E. C. Zipf, Jr., and W. G. Fastie. Apr 64, 10p
NASA Grant NsG-193-62
N64-18081
OTS $0.50

DESCRIPTORS: *Atmospheric sounding, Nitrogen, Ions, *Ionization

UCRL-6995
Lawrence Radiation Lab., Univ. of California, Livermore.
DIAGNOSTIC ESTIMATES OF THE VERTICAL EDDY DIFFUSIVITY IN THE UPPER TROPOSPHERE FROM ISOBARIC BALLOON HISTORIES
Joseph B. Knox. 30 Jun 62, 30p
Contract W7405-eng-48
OTS $2.60

ENGINEERING

BAW-1164(Vol. I)
Babcock and Wilcox Co., Lynchburg, Va.
NUCLEAR MERCHANT SHIP REACTOR. VOLUME I. DESCRIPTION OF THE NS SAVANNAH. Final Safeguards rept.
G. E. Kulynych. Jun 60, 249p
Contract AT(30-3)274
OTS $16.00

DESCRIPTORS: *Merchant vessels, *Nuclear-powered vessels, *Nuclear power plants, Safety.

WAPD-T-1516
Bettis Atomic Power Lab., Pittsburgh, Pa.
INTERPRETIVE REPORT OF PRESSURE VESSEL RESEARCH. Section 1.2, HEADS
B. F. Langer. Jun 62, 30p
Contract AT(11-1)GEN-14
OTS $2.60

DESCRIPTORS: *Pressure vessels, *Mechanical engineering, *Bibliographies.

HW-79614
Hanford Atomic Products Operation, Richland, Wash.
LARGE SCALE QUARRY BLASTING ON THE HANFORD RESERVATION
R. T. Jaske. 15 Jan 64, 66p
Contract AT(45-1)1350
OTS $1.75

SCL-R-64-40
Sandia Corp., Livermore, Calif.
RANDOM VIBRATION TERMINOLOGY AND ANALYSIS EQUIPMENT
D. F. Hillyer, Jr. Feb 64, 61p
OTS $1.75

TID-16726
Sandia Corp., Albuquerque, N. Mex.
SANDIA'S EXPERIENCE WITH COMBINED LINEAR ACCELERATION AND VIBRATION ENVIRONMENT
Charles G. Sain. [17 Sep 62] 27p
Contract AT(29-1)789
OTS $2.60

TID-16789
Sandia Corp., Albuquerque, N. Mex.
SHOCK TEST METHODS VERSUS SHOCK TEST SPECIFICATIONS
R. O. Brooks. [1962] 25p
Contract AT(29-1)789
SCDC-2725
OTS $2.60

TID-16606
Sandia Corp., Albuquerque, N. Mex.
STANDARD TEST METHODS
E. H. Copeland. [17 Sep 62] 16p
Contract AT(29-1)789
OTS $1.60

SCR-612
Sandia Corp., Albuquerque, N. Mex.
THE TESTING OF CYLINDRICAL SQUARES
J. C. Moody. Feb 63, 14p
Contract AT(29-1)789
OTS $1.60

Y-KH-19
Union Carbide Nuclear Co., Oak Ridge, Tenn.
CALCULATION OF INSPECTION DATA FOR RADIAL TYPE MEASURING MACHINES
C. W. Wilson and A. H. Fowler. 22 Oct 62, 19p
Contract W7405-eng-26
OTS $1.60

DESCRIPTORS: *Meters, *Programming (Computers) *Thickness,

Aeronautical Engineering

AD-422 643

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CATEGORY II LOW TEMPERATURE EVALUATION OF A YUH-1D HELICOPTER IN THE ARCTIC. Rept. for 20 Dec 62-17 Jan 63
Billy L. White. Sep 63, 144p
ASD-TDR-63-564; N64-12680
OTS $2.75

DESCRIPTORS: *Helicopters, Environmental tests, *Cold weather tests, Maintenance, Fuel systems, *Heaters, De-icing systems, Helicopter engines, Gas turbines, Flight control systems.

The model YUH-1D helicopter was tested at temperatures down to -51°F in the Arctic at Eielson AFB, Alaska, during the period of 20 December 1962 through 17 January 1963. The report presents the data that was

collected during the test and a discussion and analysis of the low temperature deficiencies that were encountered. The most significant deficiencies that were encountered were excessive engine oil pressure during starts below -20°F and erratic operation of the bleed-air driven fuel boost pump. The helicopter can be expected to operate successfully in an Arctic environment if corrective action is taken as outlined in the Recommendations of this report. (Author)

AD-430 012 repriced
Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
FIXED-BASE SIMULATOR INVESTIGATION OF THE EFFECTS OF L SUB-ALPHA AND TRUE SPEED ON PILOT OPINION OF LONGITUDINAL FLYING QUALITIES
Charles R. Chalk. Nov 63, 180p.
Contract AF33(657)7442
ASD-TDR-63-399; N64-16647
OTS $3.00

DESCRIPTORS: *Airplanes, *Elevators, *Pilots, Reaction (Psychology), Flight simulators, Performance (Engineering), Fighters, Bombers, Turbulence, Acceleration, Lift, Tests, Flight speeds, Simulation, Functions, Gusts, Angle of attack.

The study is directed toward investigating the effects on pilots rating of large variations (L alpha) in the relative amplitude and phase of the basic airplane responses to elevator control. The effects of L alpha and true speed on longitudinal flying qualities, optimum control gain, and normal acceleration response to turbulence were investigated in a ground simulator. The steady state ratio of normal acceleation to angle of attack was found to be of significance both to the flying qualities of an airplane and to the optimum longitudinal control gain. Normal acceleration response to rough air was demonstrated to be primarily a function of L alpha and the short period frequency and damping ratio. (Author)

Chemical Engineering

ANL-6725
Argonne National Lab., Ill.
CHEMICAL ENGINEERING DIVISION SUMMARY REPORT, APRIL-JUNE, 1963 [Jul 63] 246p
Contract W31-109-eng-38
N64-18201
OTS $3.50

AD-423 680
Battelle Memorial Inst., Columbus, Ohio.
RESEARCH ON SOLID-PHOSPHORUS PENTOXIDE ELECTROLYTES IN ELECTROLYSIS CELL FOR PRODUCTION OF BREATHING OXYGEN. Rept. for 15 Jun 62-30 Jun 63, on Equipment for Life Support in Aerospace
John G. Beach, John Clifford, James Gates, and Charles Faust. Oct 63, 41p
Contract AF33(657)9355
AMRL-TDR-63-95; N64-12979
OTS $1.25

DESCRIPTORS: *Gas generators, Oxygen, Production, *Electrolytic cells, Construction, Effectiveness, Water, Electrolysis, Phosphorus compounds, Oxides, *Oxygen equipment.

Electrolysis of water in hydrated phosphorus pentoxide electrolytes was investigated towards the production of oxygen to satisfy the needs of three men, 6 pounds per day. Two, 1/10-man, laboratory-model units were operated for periods totaling about 200 hours of electrolysis per unit. Equilibrium conditions of absorption and electrolysis were maintained for periods up to 79 hours. Water absorption into the phosphoric-acid electrolyte from moist air circulated to the anode passages of the units was sufficient to replace that consumed by electrolysis. A 3-man electrolysis unit is projected consisting of a battery of the 1/10-man units weighing less than 159 pounds, occupying about 1.1 cubic feet of space, and requiring 1560 watts of power. (Author)

HW-69738
Hanford Atomic Products Operation, Richland, Wash.
PARAMETERS IN THE CONVERSION OF PLUTONIUM NITRATE TO PLUTONIUM TRICHLORIDE BY A DIRECT CALCINATION. FLUID BED CHLORINATION PROCESS
M. J. Rasmussen, G. L. Stiffler, and H. H. Hopkins, Jr. 31 May 61, declassified 5 Dec 62, 17p
Contract AT(45-1)1350
OTS $1.60

DESCRIPTORS: Chlorination, *Plutonium, *Nitrates, Chlorides,

AD-421 167
Naval Research Lab., Washington, D. C.
DIAPHRAGMS FOR THE SULFATE CYCLE ELECTROLYTIC CELL. Final rept.
J. A. Young, R. C. Clark, and K. D. Lawrence.
17 Sep 63, 15p
NRL rept. 5995
OTS $0.50

DESCRIPTORS: *Diaphragms (Mechanics), *Electrolytic cells, *Rubber, Porous materials, Carbon dioxide, Oxygen equipment, Sulfates, *Life support, Submarines.

The study of diaphragms for the sulfate cycle electrolyzer included (a) the screening of commercially available textiles, papers, and porous materials for their capability to be utilized as diaphragms, (b) the development of techniques and equipment for the realistic evaluation of candidate diaphragms, (c) the development of new combinations of fibers and resins to give improved service as diaphragms in the cell, and (d) the determination of the service life of candidate diaphragms in miniature cells which reproduce the physical, chemical, and electrical atmospheres of the full-scale cell. Of the hundreds of materials included in this study, one form of commercially available microporous rubber was without question the material of choice for use as a diaphragm. From continuous electrolyzing runs in the miniature cells lasting 125 days, this material was shown to fulfill the stringent requirements and provide the required solution flow rate, temperature, pressure, and normality of anolyte and catholyte. (Author)

ORNL-TM-522
Oak Ridge National Lab., Tenn.
DESIGN STUDIES AND COST ESTIMATES OF TWO FLUORIDE VOLATILITY PLANTS
W. L. Carter, R. P. Milford, and W. G. Stockdale.
10 Oct 62, 88p
Contract W7405-eng-26
OTS $8.10

DESCRIPTORS: *Chemical engineering, *Fluorination.

Electrical and Electronic Engineering

AD-425 699
Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PRELIMINARY WEIGHT ESTIMATES FOR ADVANCED DYNAMIC ENERGY CONVERSION SYSTEMS.
Presented at ASD 1963 Science and Engineering Symposium held at Wright-Patterson Air Force Base, Ohio, 18-19 September 1963
George D. Huffman. Sep 63, 106p
ASD-TDR-63-705
OTS $2.50

DESCRIPTORS: *Energy conversion, *Auxilliary power plants, *Rankine cycle, *Liquid metals, Design, Weight, Optimization, Symposia.

This report presents an assessment of working fluids for use in a high temperature dynamic power conversion system. The method of comparison of the various fluids consists of a preliminary design of the major system components. The results are presented as conversion system specific weights for the considered fluids, potassium, sodium, lithium, bismuth, and lead, at various values of turbine inlet temperatures. On the basis of the generated data, it has been concluded that only potassium and sodium are practical for use as a working fluid in the temperature range of consideration, 2000 R to 4000 R. It is further concluded that potassium and sodium at turbine inlet temperatures from 2800 R to 3200 R offer systems of sufficiently low weight to warrant further and more detailed investigations. (Author)

AD-422 426
Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio
REMOTE AIRBORNE TELEVISION DISPLAY OF GROUND RADAR COVERAGE VIA TACAN (RATAC).
Rept. for Aug-Oct 62
Bert W. Sullivan. Sep 63, 38p
ASD-TDR-63-730; N64-12174
OTS $1.00

DESCRIPTORS: *Television display systems, Airborne, *Radar repeaters, Plan position indicators, *Television communication systems, Television equipment, Radar equipment, Tests, Performance (Engineering), Maps, Radar navigation.

A flight test program was conducted to test the feasibility of a remote airborne television display of ground radar coverage via a TACAN (RATAC) data link. This equipment was designed to give the pilot the same radar information seen by the ground radar station operator. With the aid of radar maps and different radar beacon modes, the pilot is able to identify his own aircraft radar target and navigate through a given airspace without the use of ground radar control. He is also capable of confirming the existence of other aircraft radar targets in his vicinity to a radar control station. Printed matter in the form of Alpha Numerics were also transmitted to the aircraft to demonstrate the feasibility of passing on to the pilot such instructions as flight clearances, weather information, and other NOTAMS as may be necessary. Flight tests made on the RATAC program demonstrated that the equipment is feasible, but it had some limitations which can be corrected. These limitations were caused by unfavorable television transmitter characteristics such as poor frequency stability and nonlinearity in the amplitude modulation of the radio frequency carrier wave. (Author)

AD-422 730
American Machine and Foundry Co., Alexandria, Va.
DEVELOPMENT OF A SOLID STATE ELECTRICAL DISTRIBUTION SYSTEM. Final rept., 1 Apr 62-12 Jul 63, on Solid State Matrix Program
R. N. Stock and R. W. Powell. Oct 63, 278p
Contract AF33(657)8688
ASD-TDR-63-805
OTS $4.00

DESCRIPTORS: *Aircraft equipment, *Semiconductor devices, Electrical equipment, Electrical networks, *Power equipment parts, Control systems, Distribution, Transmission lines, *De-icing systems, Computer logic, *Transistors, *Rectifiers, *Electric switches, *Circuit breakers, Aerospace craft

Two transmission links of the F-106B were re-designed as solid state systems to demonstrate the feasibility of solid state transmission links. An overall functional analysis was made and then the logic system was designed so that solid state devices would be employed most efficiently. In particular, control and protection functions were performed by a single power switch. Also, all logic was performed at a low level. However, the operational functions of the original systems were retained. The solid state systems used controlled rectifiers and power transistors as power handling devices. An interesting aspect of the systems was that relatively few types of devices were needed to implement a variety of functions. These functions included 4 areas: (1) power switches; (2) control circuits; (3) power supplies; and (4) circuit breakers. The solid state systems were tested over the temperature range of -55°C to +80°C. It was concluded that definite advantages can be provided by the application of solid state techniques to transmission links for advanced aerospace vehicles. However, 2 key problems are voltage transients and power switch cooling. (Author) (See also AD-401 094)

AD-421 566
Army Missile Command, Redstone Arsenal, Huntsville, Ala.
DESIGN AND DEVELOPMENT OF FLAT CABLE ELECTRICAL CONNECTORS. Final rept.
Charles E. Riley and Kenneth W. Plunkett. 5 Sep 63, 66p
Rept. no. RG-TR-63-25
OTS $1.75

DESCRIPTORS: *Electric connectors, *Electric terminals, Electric cables, Design, Environmental tests, *Guided missile components,

The report covers the work accomplished on flat cable connectors. Four connector concepts were developed and evaluated. Out of these four concepts, one connector was selected for further evaluation, pilot production, and environmental testing. The results of the environmental tests conducted indicate that there are certain basic deficiencies in the selected connector concept which require major design modifications. Although deficiencies do exist, much experience was gained in the area of design requirements and production techniques. (Author) (See also AD-422 778)

N64-13187
Atomics International, Canoga Park, Calif.
RADIATION EFFECTS ON ELECTRODE BEHAVIOR.
Midpoint rept., 1 Jun-31 Aug 63
G. R. Argue, H. L. Recht, and W. A. McCollum.
14 Oct 63, 25p
Contract NAS7-100
Rept. AI-8971; NASA CR-55217
OTS $2.60

DESCRIPTORS: *Batteries and components, Nickel, Cadmium, *Electrodes, *Radiation effects.

BNL-6235
Brookhaven National Lab., Upton, N. Y.
THE FAST RISE PULSER
George Kiriokos. 26 Jun 62, 2p
Contract AT(30-2)GEN-16
OTS $1.10

DESCRIPTORS: *Pulse generators, Design

AD-422 077
Delco-Remy Div., General Motors Corp., Anderson, Ind.
SILVER-ZINC SECONDARY BATTERY INVESTIGATION. Rept. for Jul 62-Aug 63
J. J. Lander and J. A. Keralla. 31 Oct 63, 87p
Contract AF33(657)8943
RTD-TDR-63-4029
OTS $2.25

DESCRIPTORS: *Storage batteries, *Silver compounds, *Zinc compounds, Potassium compounds, Hydroxides, Electrochemistry, Palladium compounds, Hydrogen, Absorption, Voltage, Oxides, Nickel compounds, Impregnation, Polyvinyl alcohol, Electrolytic cells, Alkaline cells, Mercury alloys, Electrolytes, *Battery separators.

One percent palladium added to the silver positive plate appreciably increases cycle life, maintains the monovalent charge capacity for 500 to 1000 cycles, and tends to reduce silver migration through separators. Thirty-five hundred cycles were attained by 25 a.h. cells at 25% depth of discharge containing 1% palladium impregnated positive plates. Silver particles sizes studied in the micron range of >1 to 12 do not appreciably affect voltage, capacity, or cycle life of silver plates. Sealed cell operation on the divalent voltage level is impossible, with the techniques studied, due to excessive gassing on charge. Low current density operation and high alkali concentration (45%) tend to yield maximum cycle life performance. The use of polyvinyl alcohol as a binder material in the negative active material increases negative active material increases negative plate life. Increasing Hg content of the negative plate active material and increasing KOH concentration both result in marked reduction in rates of hydrogen generation on stand in the temperature range 75 to 125°F. Increasing HgO content results in decreased cycle life. Two batteries containing 1%-palladium coated silver were cycle life tested. One achieved 633 cycles at 25% depth of discharge; the other achieved 268 cycles at 40% depth of discharge. (Author)

AD-422 900
Harry Diamond Labs., Washington, D. C.
LOW-COST, HIGH-EFFICIENCY MICROWAVE OSCILLATORS
Morris Campi. 18 Oct 63, 15p
Rept. no. TR-1177
OTS $0.50

DESCRIPTORS: *Oscillators, Microwave equipment, *Microwave oscillators, L band, Transmission lines, Printed circuits, Electron tubes, Semiconductor devices, Triodes.

L-band pulse oscillators were constructed utilizing the distributed parameter properties of strip transmission line circuitry and the high-frequency characteristics of ceramic planar triodes. The entire circuit is fabricated in low-cost printed circuitry, and the tube is the only additional component. Peak powers up to 1000 watts are delivered at 1200 Mc with 30- to 35-percent efficiency. The frequency stability is 1 Mc over the -50° to 80°C temperature range. Vibrations of 50 to 2000 cps at 15 g produce less than 1 Mc frequency deviations. (Author)

AD-423 684
Harshaw Chemical Co., Cleveland, Ohio.
INVESTIGATION OF THIN FILM CADMIUM SULFIDE SOLAR CELLS. Final rept., Sep 62-Nov 63
J. C. Schaefer, R. J. Humrick, E. R. Hill, and R. F. Belt. Nov 63, 69p
Contract AF33(657)9975
ASD-TDR-63-743
OTS $1.75

DESCRIPTORS: *Energy conversion, *Solar cells, Cadmium compounds, Sulfides, *Thin films, Performance, Single crystals, *Crystal lattice defects,

Research and development of a large area CdS, vacuum evaporated, thin film, flexible, light weight, front wall solar cell was continued in an effort to improve the performance characteristics. Efficiencies have been increased to a maximum of 5.1%. Power to weight ratios of 15 watts per pound are normal with 30 as a maximum. An upgrading procedure for low efficiency cells has been developed. Test panels have been submitted for a 30 day orbital space flight evaluation. Electron damage experiments indicate little effect on the CdS solar cells. X-ray techniques have been used to photograph dislocations in single crystal CdS. Current-voltage curves and spectral response data analyses have resulted in a one-trap model of the CdS photovoltaic cell. (Author) (See also AD-407 525)

UCRL-10009(Rev.)
Lawrence Radiation Lab., Univ. of California, Berkeley.
AN INTEGRAL DESIGN TECHNIQUE FOR WIDEBAND MULTISTAGE TRANSISTOR AMPLIFIERS
Larry Scott. 27 Apr 62, 32p
Contract W7405-eng-48
OTS $3.10

DESCRIPTORS: Amplifiers, *Transistor amplifiers, Broadband.

AD-425 876
Lockheed [Aircraft Corp.] Palo Alto, Calif.
NEW CATHODE-ANODE COUPLES USING NONAQUEOUS ELECTROLYTE. Annual rept. no. 2, Oct 62-Sep 63
H. F. Bauman, J. E. Chilton, W. J. Conner, and G. M. Cook. Oct 63, 110p
Contract AF33(616)7957
RTD-TDR-63-4083; N64-13643
OTS $2.50

DESCRIPTORS: *Batteries and components, *Storage batteries, *Alkaline cells, *Electrolytes, *Lithium, Silver compounds, Lithium compounds, Aluminum compounds, Alkanes, Organic nitrogen compounds, Methane, Carbonates, *Electrochemistry.

The properties of a lithium - silver chloride cell using nonaqueous electrolyte were studied, and sealed cells of 5-amp-hr nominal capacity fabricated and tested. Nonaqueous electrolytes were formed with $AlCl_3$ and LiCl additions to propylene carbonate (PC) and nitromethane (NM). An improved lithium deposit was obtained from the NM system and from mixed solutions of PC and NM. Mechanical fastening techniques were used to assemble multiple electrodes to terminals. Testing equipment for single cells and 5-cell batteries was designed, assembled, and is being used. Transient polarization measurements show that increased lithium resistance occurs with reduced cell capacity on long-term cycling. The study of the lithium - silver chloride cell system has led to the development of cells which operate at a current density of 1 to 2 ma/cm^2 at 2.4 to 2.6 v and yield an energy density of 20 w-hr/lb at this rate. The charge - discharge cycles which have been obtained indicate that the cells are reversible and operate as a secondary battery. (Author) (See also AD-410 577)

AD-433 087 repriced
LTV Vought Aeronautics, Dallas, Tex.
A STUDY OF NUCLEAR RADIATION EFFECTS ON TELEMETRY. VOLUME I.
Feb 64, 337p
Contract AF33(657)11646
RTD-TDR-63-4287, Vol. 1
OTS $5.00

DESCRIPTORS: *Telemeter systems, *Radiation effects *Space environmental conditions, Modules (Electronics), Nuclear particles, Design, *Realiability (Electronics), Neutrons, Gamma rays, Photoelectric effect, Dose rate, Transients, Capacitors, Ionization, Printed circuits, Coaxial cables, Quartz resonators, Electric insulation, Nuclear power plants, Nuclear propulsion, Semiconductors, Electron tubes, Electromagnetic pulses, Van Allen radiation belt, Commutators, Coding, Telemetering transmitters, Magnetic tape, Magnetic recording systems, Modulation.

The primary objectives of this study were to (1) define representative nuclear radiation environments in which telemetry circuitry may be required to operate, (2) establish the capability of off-the-shelf telemetry modules to operate properly in these environments, and (3) evolve certain criteria and 'working tools' for the design of nuclear radiation tolerant telemetry. The general approach used in accomplishing these objectives was (1) to provide a brief discussion of the effects of nuclear radiation on materials and components, (2) to discuss potential nuclear radiation environmental combinations which might affect the design of a telemetry system, (3) to establish a Representative Telemetry System Model (RTSM) which includes the pertinent building blocks which might be used in any specific system, (4) to compile, correlate, and present in a tabular format the applicable radiation effects information required to perform the detailed nuclear radiation effects analysis, and (5) to discuss certain criteria for the effective design of nuclear radiation tolerant telemetry modules. (Author)

AD-433 088 repriced
LTV Vounght Aeronautics, Dallas, Tex.
A STUDY OF NUCLEAR RADIATION EFFECTS ON TELEMETRY. VOLUME II. NUCLEAR RADIATION EFFECTS DESIGN ALLOWABLES
Feb 64, 300p
Contract AF33(657)11646
RDT-TDR-63-4287, Vol. 2
OTS $4.00

DESCRIPTORS: *Telemeter systems, Radiation effects, Design, Nuclear particles, Batteries and components, Capacitors, Electrolytic capacitors, Ceramic capacitors, Tantalum capacitors, Paper capacitors, Coaxial cables, Electric connectors, Quartz resonators, Delay lines, Magnetic materials, Electrical equipment, Electronic equipment, Resistors, Transistors, Amplifiers, Oscillators, Power supplies.

Approximately 1500 nuclear radiation effects Design Allowables on electronic materials and parts were compiled to provide a useful working tool for designing nuclear radiation tolerant telemetry systems. The radiation effects Design Allowable is a nuclear radiation environmental exposure under which the associated material or part is expected to exhibit certain specified characteristic changes. The information presented does not include all available data, but is felt to be representative of the current nuclear radiation effects state-of-technology. This data should serve as an aid in performing nuclear radiation effects analyses of currently available telementry systems and provide useful inputs for hardening such systems for use in a nuclear radiation environment. (Author) (See also AD-433 087)

N64-13002
Mallory (P. R.) and Co., Inc., Burlington, Mass.
RESEARCH AND DEVELOPMENT OF A HIGH CAPACITY NONAQUEOUS SECONDARY BATTERY.
Quarterly rept. no. 1 [1963] 42p
Contract NAS3-2780
NASA CR-55015
OTS $4.60

DESCRIPTORS: *Storage batteries, Electrochemistry.

AD-430 736 repriced
National Cash Register Co., Dayton, Ohio.
FEASIBILITY INVESTIGATION OF CHEMICALLY SPRAYED THIN FILM PHOTOVOLTAIC CONVERTERS.
Technical summary rept., 1 Feb-31 Oct 63
R. R. Chamberlin and J. S. Skarman. 31 Oct 63, 55p
Contract AF33(657)7919
ASD-TDR-63-223, Part II; N64-16500
OTS $1.50

DESCRIPTORS: *Energy conversion, *Solar cells, *Semiconductor films, Photoelectric cells (Semiconductor), Preparation, Sprays, *Silicon, Cadmium compounds, Copper alloys, Sulfides, Tellurides, Phosphides, Bronze, Electrical properties, Hall effect, Feasibility studies.

The objectives of this phase were (1) to improve the characteristics of chemically sprayed, large area, thin film solar cells from the standpoint of efficiency, weight and lifetime, and (2) to fabricate for delivery a one-foot square photovoltaic array. Research during the second phase was primarily directed to extending this feasibility of material and process to the fabrication of a solar cell using metal foil as a substrate. This research also covered the demonstration of heterogeneous junction photovoltaic effect using chemically sprayed films with Si, CdTe, and GaP. One photovoltaic thin film CdS array one-foot square was fabricated for delivery. The array which was composed of nine cells, each approximately four inches square, had an efficiency of .03%. This efficiency does not indicate the potential of the process since single four inch square cells were made with .3% efficiency and one inch square cells with an efficiency of 1.2%. (Author) (See also AD-403 053)

AD-424 542
North American Aviation, Inc., Los Angeles, Calif.
CATHODE-RAY TUBE INSTRUMENT SYNTHESIS SYSTEM. Rept. for Feb 61-Sep 62, on Simulation Techniques for Aerospace Crew Training
R. N. Winner and A. Zilgalvis. Oct 63, 52p
Contract AF33(616)7859
AMRL-TDR-63-84; N64-12074
OTS $1.50

DESCRIPTORS: *Cathode ray tubes, Display systems, Oscilloscopes, Cockpits, *Flight instruments, Synthesis, Simulation, Design.

A design study was conducted leading to development of a flexible laboratory design tool for synthesizing and analyzing cockpit displays. The resulting cathode-ray tube instrument synthesis system (CRT-ISS) is compatible with standard analog computer systems and has a self-contained provision for generation of 50 alphanumeric and geometric symbols, each of which can be displayed by any or all of the 64 time-shared display channels. In addition, the size, static vertical and horizontal positioning, and intensity of each symbol displayed can be independently controlled for each of the 64 channels. The preprogramming of the display is accomplished by patch cord plugging and adjustment of potentiometers. The output of the system consists of X-, Y-, and Z-axes signals which permit driving conventional cathode-ray tube oscilloscopes singly, in multiples, or in various combinations. An additional task of the design study was the development of a 21-inch solid-state display oscilloscope. (Author)

TID-18488
Ohio State Univ. Research Foundation, Columbus.
THEORETICAL ANALYSIS OF COAXIAL SUPPORTS. Final rept.
W. Alverson, H. D. Chai, and F. J. Tischer. Feb 62, 96p
Contract AT(29-1)789
Rept. 1378-Final; SCDC-2650
OTS $8.60

AD-428 634 repriced
RCA Defense Electronic Products, Princeton, N. J.
APPLIED RESEARCH PROGRAM ON HIGH TEMPERATURE RADIATION RESISTANT SOLAR CELL ARRAY, VOLUME II. Final rept., 15 Apr-14 Oct 63, on Static Energy Conversion Technology
J. F. Wise. Dec 63, 64p
Contract AF33(657)8490
Rept. no. AED-R-2117; ASD-TDR-63-516, Vol. II; N64-14649
OTS $1.75

DESCRIPTORS: *Solar cells, *High-temperature research, *Radiation damage, Configuration, Aerospace craft, Gallium compounds, Arsenides, Cadmium compounds, Sulfides, Thin films (Storage devices).

This technical report presents the results of the research, testing, and fabrication performed during the period from April 15, 1963, to October 15, 1963. The overall objective of the program is the development of the technology necessary for the production of a high-temperature, radiation-resistant, solar-cell array in a configuration suitable to aerospace vehicles. This project includes (1) determination of the mechanical, thermal, optical, and electrical parameters of gallium arsenide (GaAs) cells, individually and as part of a panel; (2) evaluation of the performance of GaAs cells under the conditions of nuclear radiation encountered in an orbital environment as compared with Silicon (Si) and cadmium (CdS) cells in similar environments; (3) a feasibility study of thin-film GaAs; and (4) a document summarizing the work and containing recommendations for further research and development in this area. Further investigation and fabrication were made of thin-film GaAs cells. A newly developed surface-barrier type was studied as well as the customary p-n junction units. (Author) (See also AD-296 367)

AD-400 976
Stanford Electronics Labs., Stanford Univ., Calif.
A STUDY OF MATCHING CONDITIONS IN A TWO-LOOP FREQUENCY MULTIPLER USING A CAPACITANCE DIODE
Albert Guissard. Dec 62, 75p
Contract Nonr-225(24)
Technical rept. no. 2256-1; SEL-62-154
OTS $7.60

DESCRIPTORS: *Nonlinear systems, *Frequency multipliers, Circuits, *Impedance matching, *Diodes, Capactance, Taylor's series.

The report is concerned with the problem of finding the matching conditions in a two-loop frequency multiplier, using a nonlinear capacitance diode. The first part is devoted to a theoretical approach to the problem. The analysis is restricted to the case where the nonlinear reactance is a nonlinear capacitance diode whose characteristic function can be expanded in a Taylor series.

The circuit equations for a multiplication of order N are established and the matching conditions are found and discussed. The influence of the dc bias voltage of the diode is also pointed out. In the second part, the results of the experimental study of a frequency doubler, from this point of view, are summed up. In addition, some response curves are given. These curves are interesting because they would be difficult to deduce from the circuit equations and give a better understanding of the phenomena which take place. (Author)

AD-429 335 repriced
Thermo-Electron Engineering Corp., Waltham, Mass.
ADDITIVE CONVERTER STUDIES. Final rept. Nov 62-Nov 63
S. S. Kitrilakis and J. H. Weinstein. Jan 64, 59p
Contract AF33(657)10130
Rept. no. 35-64; APL-TDR-64-2; N64-15697
OTS $1.50

DESCRIPTORS: *Thermionic converters, Effectiveness, *Electrodes, Refractory materials, *Temperature, Cesium compounds, Electric current, Electric potential, Seals (Stoppers), Ceramic materials, Vapors, Heating elements, Performance (Engineering), Halides, *Additives, Tungsten, Molybdenum, Fluorides, Power, Rhenium, Nickel alloys, Copper alloys

Results of a program aimed at improving the performance of thermionic converters through the use of cesium halide additives are reported. These results show that such improvement is achieved and is due to the reduction of collector work function at each operating condition. The reduction in work function is achieved by a shift in the ratio of collector-to-cesium reservoir temperature ratio at which the minimum collector work function is obtained, thus allowing the converter to be operated closer to the condition of minimum collector work function than is useful in the cesium- only case. It is also reported that corrosion and metallurgical examinations show no evidence of chemical attack upon converter components, which can be attributed to the additives. (Author)

N64-17205
Westinghouse Electric Corp., Lima, Ohio
PARALLEL INVERTER AND CONVERTER OPERATION AND IMPROVEMENTS IN TRANSFORMERS.
Quarterly rept. no. 1, 28 Jun-27 Sep 63
G. W. Ernsberger, J. L. Klingenberger, and H. R. Howell. [1963] 95p
Contract NAS3-2792
NASA CR-53206
OTS $8.60

DESCRIPTORS: *Transformers, Inverters, Design.

N64-17760
Westinghouse Electric Corp., Lima, Ohio.
PARALLEL INVERTER AND CONVERTER OPERATION AND IMPROVEMENTS IN TRANSFORMERS. Quarterly rept. no. 2, 28 Sep-27 Dec 63
G. W. Ernsberger and H. R. Howell. [1963] 57p
Contract NAS3-2792
NASA CR-54012
OTS $5.60

DESCRIPTORS: *Transformers, Inverters, Model tests, Magnetic cores.

N64-17763
037 040
Allied Research Associates, Inc., Concord, Mass.
MINIMUM WEIGHT DESIGN OF STIFFENED CYLINDERS FOR LAUNCH VEHICLE APPLICATIONS
George Gerard and Ralph Papirno. 13 Mar 64, 38p
Contract NASw-682
Tech. rept. 235-5; NASA CR-53317
OTS $3.60

DESCRIPTORS: *Stiffened cylinders, *Launch vehicles (Aerospace), Weight, Optimization.

N64-17764
037 040
Allied Research Associates, Inc., Concord, Mass.
WEIGHT AND PERFORMANCE DESIGN INDICES FOR IDEALIZED SPACECRAFT LANDING SYSTEMS
Roger Milligan and George Gerard. 13 Mar 64, 38p
Contract NASw-682
Tech. rept. 235-6; NASA CR-53320
OTS $3.60

DESCRIPTORS: *Spacecraft, *Landing gear, Performance (Engineering), Optimization.

AI-7950
Atomics International, Canoga Park, Calif.
APPLICATION OF SNAP 2 TO MANNED ORBITAL SPACE STATIONS
H. N. Rosenberg, ed. [17 May 63] 90p
Contract AT(11-1)GEN-8
OTS $8.10

DESCRIPTORS; Space flight, *Space stations.

SCTM-122-63(71)
Georgia Inst. of Tech., Atlanta.
DYNAMIC STABILITY OF A MISSILE UNDER VARIABLE VELOCITY CONDITIONS
Frank M. White, Jr., and William J. Steinmetz. Jun 63, 30p
Contract AT(29-1)789, subcontract
OTS $2.60

DESCRIPTORS: *Guided missiles, Stability, *Aerodynamic characteristics,

N63-20208
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
THE PURPOSES OF ENVIRONMENT TESTING FOR SCIENTIFIC SATELLITES
John H. Boekkel. 12 Feb 63, 37p
NASA TM-X-50266; NASA-X-32063-26
OTS $3.60

DESCRIPTORS: *Environmental tests, *Scientific satellites,

N64-17611
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
SATELLITE SITUATION REPORT, VOL. 4, NO. 4
1 Mar 64, 27p
Technical memo X-51288; X-533-63-1
OTS $2.60

DESCRIPTORS: *Satellites (Artificial), Reviews, Reports,

NASA-TN-D-2147
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
THERMAL RADIATION TO A FLAT SURFACE ROTATING ABOUT AN ARBITRARY AXIS IN AN ELLIPTICAL EARTH ORBIT: APPLICATION TO SPIN-STABILIZED SATELLITES
Edward L. Powers. Apr 64, 25p
N64-17745
OTS $0.75

DESCRIPTORS: *Thermal radiation, Flat plate models, *Elliptical orbit trajectories, *Solar radiation, Satellites (Artificial), Numerical analysis.

AD-425 800
Goodyear Aerospace Corp., Akron, Ohio.
DESIGN OF LENS-REFLECTOR ELEMENT FOR PASSIVE COMMUNICATIONS SATELLITE. Final rept., Jul 61-Jun 63, on Construction and Testing of Electromagnetic Lens Reflector Components
W. D. Wise. Nov 63, 44p
Contract AF33(616)8475
Rept. no. GER-11159; ASD-TDR-63-781; N64-14321
OTS $1.25

DESCRIPTORS: *Communication satellites (Passive), Lenses, *Reflectors, Design, Performance (Engineering), *Electromagnetic lenses.

A study combining theoretical analysis and electrical performance testing of thin lens-reflector elements for use on a high-gain, directional, broad-band, passive communications satellite was conducted. It was determined that a diffraction-limited device, where the diameter was four wave lengths at the design frequency, was superior to a refracting lens-reflector having a diameter of 18 wave lengths at the design frequency, considering incident angles from 0 deg to 45 deg. As part of the program, the interrelation between element design and satellite characteristics were developed and several types of elements were compared. A 10-in. -diameter plano-ellipsoidal lens and a spherical reflector were selected as an optimum design. A lightweight inflatable element of this design was tested. (Author)

AD-424 174
Goodyear [Aerospace] Corp., Akron, Ohio.
EVALUATION OF MODEL LENS-REFLECTOR-TYPE COMMUNICATIONS SATELLITE. Final rept., Oct 61-May 63, on Fabrication and Testing of a Five-Foot-Diameter Model Directional Passive Satellite
W. D. Wise, M. Miller, and P. J. Wilcox. Oct 63, 82p
Contract AF33(657)7338
Rept. no. GER-11123; ASD-TDR-63-779; N64-12189
OTS $2.25

DESCRIPTORS: *Communication satellites (Passive), Lenses, *Reflectors, *Electromagnetic lenses, Models (Simulations), Performance (Engineering), Tests.

A 5-ft-diameter spherical model of a unique design of a non-oriented high-altitude passive communications satellite was evaluated for monostatic and bistatic performance with vertical, horizontal, and circular polarizations from 2 to 8 kmc. The design utilized thin lens-reflector elements covering the sphere and having a diffraction-limited design beam width of 17 deg at 5 kmc. The model showed a substantial gain over a simple sphere, but exhibited large signal fluctuations. The fluctuations were dampened by placing the reflective elements on a 10-ft radius of curvature; this indicated the possibility of a constant return from a full-size design. (Author)

AD-423 436
Goodyear [Aerospace] Corp., Akron, Ohio.
INVESTIGATION OF DIELECTRIC MATERIAL FOR ERECTABLE LENSES. Rept. for Jul 61-Jun 63, on Development of a Material and Techniques for Fabricating Electromagnetic Lens in an Orbit Environment
W. D. Wise and B. M. Miller. Oct 63, 52p
Contract AF33(616)8474
Rept. no. GER-11147; ASD-TDR-63-780; N64-11930
OTS $1.50

DESCRIPTORS: *Satellites (Artificial), *Communication satellites (Passive), *Reflectors, *Electromagnetic lenses, Inflatable structures, *Dielectrics, *Aluminum, Foils, *Plastic films, Packaging.

Material-structure systems characterized by light weight, a dielectric constant of 3.6 to 4.0, low dissipative loss, and erectability from a compact state in an orbital environment were investigated to implement a concept for a high-gain passive nonoriented communications satellite based on covering a large diameter sphere with thin lens-reflector elements. A lens medium of a random maze of aluminum slivers in a plastic filament was selected as a practical system and an inflatable element was built, electrically tested, and erected in a simulated orbital environment. (Author)

AD-422 710
Harry Diamond Labs., Washington, D. C.
A TWO-WIRE SETTING SYSTEM FOR ELECTRONIC TIMERS
Ira R. Marcus. 30 Sep 63, 15p
Rept. no. TR-1150; N64-12933
OTS $0.50

DESCRIPTORS: *Timing devices, Electronic equipment, Timing circuits, Computer logic, Wire, Explosive initiators, Detonators, *Fuze setters.

A method for setting an electronic timer through two wires is described. The electronic timer is powered, reset, set, monitored and its safety status line checked through two wires connecting the setter and the timer. (Author)

AD-422 899
Harry Diamond Labs., Washington, D. C.
THE USE OF ELECTROCHEMICAL SYSTEMS FOR TIMING
Judith B. Lipnick. 30 Oct 63, 26p
Rept. no. TR-1156; N64-13314
OTS $0.75

DESCRIPTORS: *Timing devices, *Delay elements (Explosive), Integrators, *Electrolytic cells, Electrochemistry, Feasibility studies.

An investigation was conducted toward determining the feasibility of a military timer using a constant-current power supply, an electrochemical delay cell, and a suitable detector. In the initial phase of this study, which is the subject of the report, only the feasibility of developing an electrochemical delay cell is considered. A review of electrochemical delay systems is presented. Limited preliminary tests of two commercial cells and of several experimental systems are described. Several systems were found to work accurately at room temperature and above. However, at low temperatures, the systems operate unreliably, exhibit high impedance, and have insufficiently sharp end-point indications. It may be possible to improve the performance of the cells in these respects through proper choice of electrolyte making an inexpensive cell practicable, with accuracies better than 1 percent for delay times of 100 sec to one year. Further research is therefore recommended. 45 refs. (Author)

N63-12919
Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
APOLLO GUIDANCE AND NAVIGATION. THE HEAT TRANSFER PROPERTIES OF STRUCTURAL ELEMENTS FOR SPACE INSTRUMENTS
Richard M. Jansson. Jun 62, 22p
Contract NAS9-153
E-1173
OTS $2.60

DESCRIPTORS: *Space navigation, *Guidance, *Instrumentation, Heat transfer,

N64-17226
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DETERMINATION OF TRACKING STATION LOCATIONS BY DOPPLER AND RANGE MEASUREMENTS TO AN EARTH SATELLITE
D. L. Cain and T. W. Hamilton. 1 Feb 64, 21p
Contract NAS7-100
Technical rept. no. 32-534; NASA CR-53196
OTS $2.60

DESCRIPTORS: *Position finding, *Tracking, Buildings, *Doppler systems, *Satellites (Artificial).

LADC-5765
Los Alamos Scientific Lab., N. Mex.
NUCLEAR AEROSPACE SAFETY PROBLEMS
L. D. P. King. Apr 63, 14p
Contract W7405-eng-36
OTS $1.60

DESCRIPTORS: *Safety, Hazards, Space flight, *Space environmental conditions, *Nuclear propulsion.

AD-422 198
Naval Ordnance Lab., White Oak, Md.
THE TREATMENT OF AIRBLAST RADIUS-TIME AND PRESSURE-DISTANCE DATA BY THE USE OF POLYNOMIAL APPROXIMATIONS, WITH APPLICATION TO PENTOLITE DATA
D. L. Lehto and L. J. Belliveau. Mar 62, 27p
NOLTR 62-85; DASA-1352
OTS $0.75

DESCRIPTORS: *Air burst, *Explosion effects, *Pentolite, *Polynomials, Programming languages, Numerical analysis.

Two of the more important airblast characteristics are the pressure-distance relation and the time-of-arrival (radius-time) relation. In principle it is possible to relate them via the Rankine-Hugoniot relations. But experimental data often contain a great deal of scatter. In order to obtain the one relation from the other, a smoothing function is applied to the data, and this function is then either differentiated or integrated to give the pressure-distance or radius-time curve. If both sets of experimental data are available, a cross check on smoothing functions and reduction of scatter can be obtained by trying to go from the one curve to the other and back again. This report describes the use of polynomials in the logarithm of the variables in this task, and the application to the standard pentolite data. The variable gamma correction for real gases is applied at close-in distance. (Author)

PB-165 239
[Research Analysis Corp., McLean, Va.]
LOGSIM-W: A LOGISTICS SIMULATION OF THE WHOLESALE ARMY SUPPLY SYSTEM. Staff paper.
May 59, 75p
[Contract DA44-188-ARO-1]
ORO-SP-106; AD-215 777
OTS $7.60

DESCRIPTORS: *Logistics, Simulation, *Training, *Decision making, *Armed forces supplies, *Army procurement, Distribution (Economics), Disposal, Maintenance, Management planning,

The manual comprises an excercise designed to train supply management personnel of the U. S. Army by use of a logistics simulation at the wholesale level. The simulation is simple enough for interest in play and yet complex enough for realistic illustration of Army supply management procedures. Inasmuch as the hub of the operations of the wholesale supply system is found in the national inventory control points, demand and problems occurring in the simulation require decisions at that level. At least three items are managed in the simulation. The number of items managed is dependent on time available. Decisions and actions of supply managers usually are not confined to one functional area of supply. Accordingly, LOGSIM-W is designed to include elements of requirements, procurement, distribution, disposal and maintenance. Controls aspects are embodied in determination of costs and efficiency of meeting demand. (Author)

PB-165 240
[Research Analysis Corp., McLean, Va.]
LOGSIM-W: A LOGISTICS SIMULATION OF THE WHOLESALE ARMY SUPPLY SYSTEM. INSTRUCTOR'S MANUAL.
Staff paper. May 59, 94p
[Contract DA44-188-ARO-1]
ORO-SP-107; AD-215 778
OTS $8.60

DESCRIPTORS: *Logistics, Simulation, *Training, *Decision making, *Armed forces supplies, *Army procurement, Distribution (Economics), Maintenance, Control, Management planning,

See also PB-165 239

AD-423 251
Rock Island Arsenal Lab., Ill.
EXPERIMENTAL HEAT TREATMENT OF M-60 MACHINE GUN BOLTS
P. E. Goettsch. 27 Aug 63, 25p
Rept. no. 63-2761
OTS $0.75

DESCRIPTORS: *Steel, Heat treatment, Hardening, Impact shock, Toughness, *Automatic weapons, Small arms, *Gun components, *Breech mechanisms,

The report covers the development and testing of carburizing and heat treating procedures for a series of experimental M-60 Machine Gun Bolts manufactured of 9310 alloy steel. Acceptable case and core properties were obtained with minimum heat treat distortion by quenching the subject bolts direct from a 1700°F gas carburizing treatment into a still salt bath at 400°F, followed by -100°F refrigerating and 350°F tempering treatments. Comparative low temperature impact data were obtained on carburized 8620 and 9310 material in oil quenched and 400°F salt quenched conditions. (Author)

SCTM-98-56-51
Sandia Corp., Albuquerque, N. Mex.
A FULL-SCALE TESTING FACILITY FOR THE COMPONENT RECOVERY PROGRAM
W. E. Taylor. 17 Jul 56, 16p
Contract AT(29-1)789
OTS $1.60

N64-17677

Space Technology Labs., Inc., Redondo Beach, Calif.
REDUCTION AND ANALYSIS OF EXPLORER VI AND PIONEER V DATA, VOLUME I. Final rept.
Alan Rosen. 30 Nov 62, 199p
Contract NASw-270
Rept. 8626-6006-RU-000; NASA CR-55802
OTS $13.50

DESCRIPTORS: *Scientific satellites, *Telemetering data, Reduction, Analysis.

AD-429 246 repriced
Springfield Armory, Mass.
ONE-YEAR TROPICAL EXPOSURE OF WOOD STOCKS AND PLASTIC STOCKS FOR THE M14, 7.62MM, RIFLE. Rept. on Rifle, 7.62MM, M14 - Continued Development of Plastic Stocks and Handguards
J. Szanto. 27 May 63, 20p
Rept. SA-TR11-2637
OTS $0.50

DESCRIPTORS: *Small arms, *Gun components, Structural parts, *Wood, Plastics, *Composite materials, *Laminated plastics, Reinforcing materials, *Glass textiles, Environmental tests, *Tropical tests, Heat, Humidity, Fungus deterioration, Insects, Rodents.

Fiber glass reinforced plastic stocks were compared with wood stocks for weatherability. Five walnut and five birch stocks were tested at the NRL Tropical Exposure Site, Canal Zone, together with five plastic stocks of the latest design. The effect of heat, humidity and mildew under tropical wet conditions was determined from these tests. The damaging effect caused by chewing or biting or boring insects, vermin, rodents, and other forms of life indigenous to the area was also determined from these tests. Fiber glass reinforced plastic stocks successfully withstood the one-year exposure to tropical environment. Procedure is described and results discussed. (Author)

Sanitation and Safety Engineering

PB-165 333
Applied Psychology Corp., Arlington, Va.
DISTANCE ESTIMATION OF FREQUENCY-CODED AND UNIFORMLY FLASHING LIGHTS. Technical rept. no. 12 Jun 62, 24p
Contract FAA/BRD-127
N63-18268
OTS $2.60

DESCRIPTORS: *Signal lights, Range finding, Pilots, Visual acuity, *Space perception, *Visual signals, *Aviation safety, Applied psychology.

The accuracy with which pilots can judge the distance to a uniformly flashing light and to a light providing flash rate cues of distance was measured in a laboratory setting, for the purpose of determining whether distance cues improved accuracy. For each kind of light, subjects made practice judgments in which they were told their accuracy, then completed a series of test problems without accuracy information. Results indicate that judgments made without flash rate cues are as accurate as when these cues are provided. Nearer lights tend to be judged as being farther away than they actually are, and far lights are judged as being nearer than actual. At least within the short distances studied, extra cues to actual distances of a light of the type provided in this experiment do not improve accuracy of distance judgments when the observers have had practice. (Author)

AD-424 590
Electric Boat Div., General Dynamics Corp., Groton, Conn.
A LABORATORY MODEL OF AN INTEGRATED WATER RECOVERY SYSTEM. Final rept. for Jun 62-May 63, on Equipment for Life Support in Aerospace
J. B. Presti, H. C. Miner, R. Nickerson, and H. Wallman. Oct 63, 45p
Contract AF33(657)9310
Rept. no. U413-63-100; AMRL-TDR-63-88; N64-12217
OTS $1.25

DESCRIPTORS: *Life support, *Water supplies, *Wastes (Sanitary engineering), *Urine, Purification, Tanks (Containers), Distilling plants, Evaporators, Condensers (Liquefiers), Compressors, Pumps, Heaters, Control panels.

A study was conducted to construct and test a laboratory model of an Integrated Water Recovery System. The system was designed to convert to potable water 4.2 liters of urine plus 5.0 liters of wash water daily, under weightless conditions. It consists of a vapor compression distillation still, a post-filtration system, waste water and potable water storage tanks, a hot and cold water dispensing unit, and a graphic display control panel. This system produces potable water at the approximate design capacity under weightless conditions. (Author)

HW-SA-2730
Hanford Atomic Products Operation, Richland, Wash.
DOSIMETRY INVESTIGATION OF THE RECUPLEX CRITICALITY ACCIDENT. [1962] 32p
Contract AT(45-1)1350
OTS $3.60

DESCRIPTORS: *Dosimeters, Accidents, Health physics, *Safety,

LAMS-2378(Vol. II)
Los Alamos Scientific Lab., N. Mex.
CHEMICAL DETECTORS. A BIBLIOGRAPHY FOR THE INDUSTRIAL HYGIENIST WITH ABSTRACTS AND ANNOTATIONS
Evan E. Campbell and Helen M. Miller, comp. Dec 63, 463p
Contract W7405-eng-36
OTS $5.50

LA-2735 Rev.
Los Alamos Scientific Lab., N. Mex.
REVISIONS TO LA-2735 FAST REACTOR CORE TEST FACILITY SAFETY ANALYSIS REPORT. Rept on Contract W7405-eng-36. 17 Jun 63, 154p
OTS $0.50

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Food

TID-18036
Fish and Wildlife Service, Seattle, Wash.
APPLICATION OF RADIATION-PASTEURIZATION PROCESS TO PACIFIC CRAB AND FLOUNDER. Final summary rept. Oct 61-Sep 62
D. Miyauchi, M. Eklund, J. Dassow, J. Spinelli, and N. Stoll. Apr 63, 48p
Contract AT(49-11)2058
OTS $4.60

DESCRIPTORS: *Irradiated foods, *Meats, *Pasteurization

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

N64-17820
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AN EXPERIMENTAL INVESTIGATION OF UNCOOLED THRUST CHAMBER MATERIALS FOR USE IN STORABLE LIQUID PROPELLANT ROCKET ENGINES
R. W. Rowley. 15 Feb 64, 30p
Contract NAS7-100
Technical rept. no. 32-561; NASA CR-53367
OTS $2.60

DESCRIPTORS: *Rocket motors, Thrust, *Combustion chambers, Materials, *Liquid rocket propellants, Feasibility studies.

Machine Parts and Mechanisms

UCRL-10326
Lawrence Radiation Lab., Univ. of California, Berkeley.
MULTIPURPOSE BALL VALVES
William L. Pope. 22 Jun 62, 11p
Contract W7405-eng-48
OTS $1.60

DESCRIPTORS: *Valves, Design.

Manufacturing Equipment and Processes

TID-19158
Hanford Atomic Products Operation, Richland, Wash.
WELDOR PERFORMANCE QUALIFICATION PROCEDURE
P. S. Kingsley. 1 Jul 63, 14p
Contract AT(45-1)1350
HWS-8225(rev. 5)
OTS $1.60

DESCRIPTORS: *Stainless steel, *Welding

AD-421 879
Army Materials Research Agency, Watertown, Mass.
DEVELOPMENT OF IMPROVED ULTRASONIC BOND INSPECTION EQUIPMENT. Rept. on Nondestructive Testing Test Equipment
Paul E. J. Vogel and Otto R. Gericke. Oct 63, 12p
Technical rept. AMRA TR 63-16
OTS $0.50

DESCRIPTORS: *Test equipment, *Non-destructive testing, *Bonding, *Laminates, Ultrasonic radiation, Acoustic properties.

The report on the findings of a continuing project in the development of improved ultrasonic bond inspection equipment includes a description of a small immersion tank for laboratory experimentation, an evaluation of certain focused immersion transducers, and a portrayal of bond flaws detected in laminations of materials having greatly dissimilar acoustical properties. (Author)

AD-425 443
Bendix Corp., Eatontown, N. J.
CERAMIC TO METAL SEALS FOR HIGH-TEMPERATURE THERMIONIC CONVERTERS. Rept. for 1 Oct 62-30 Sep 63
M. L. Dring. Oct 63, 89p
Contract AF33(657)10038
Rept. no. RBESO 3404-4; RTD-TDR-63-4109; N64-12672
OTS $2.25

DESCRIPTORS: *Seals (Stoppers), Ceramic materials, Metal seals, *Bonding, *Thermionic converters High-temperature research.

An investigation was carried on in the materials and methods which are considered possibly useful in forming ceramic to metal seals and composite structures for use in the environment of cesium-plasma thermionic converters. Studies of five specific means of joining refractory metals to alumina were undertaken, as well as studies of metallizing methods, of forming graded tungsten-alumina composites, and of the possible metals and ceramics which could be utilized best in structures operated at 2000°C. The five joining methods studied are (1) Formation of a continuous electroplated layer of refractory metal across the adjacent surfaces of metal and ceramic; (2) Welding of a metal member to the ceramic by ultrasonic welding techniques; i.e., without heat; (3) Use of high temperature brazing alloys; (4) Formation of a bond between metal and ceramic by the diffusion of compatible intermediate materials into both structural members; and (5) Welding of single oxide ceramics directly to refractory metals using electron-beam welding equipment.

AD-421 886
Dynatech Corp., Cambridge, Mass.
AN INSTRUMENT FOR MEASURING THE THERMAL CONDUCTANCE OF HIGH-TEMPERATURE STRUCTURAL MATERIALS. Rept. for 1 Mar 61-Sep 63, on Data Collection and Correlation
J. K. Sparrell, K. G. Coumou, and J. D. Plunkett.
Sep 63, 52p
Contract AF33(616)8099
Rept. no. 372; ASD-TDR-63-359; N64-12869
OTS $1.50

DESCRIPTORS: *Thermal conductivity, *Test equipment, Sandwich construction, *Honeycomb cores, Ceramic materials, Cermets, *Copper, Aluminum compounds, Oxides, *Titanium alloys, *Cobalt alloys, *Stainless steel, *Silicon compounds, Dioxides.

A thermal conductivity apparatus employing the absolute guarded hot plate principle was designed, developed and fabricated. The primary objective of this instrument is to test honeycomb structures at elevated temperatures. A secondary objective is to test super-alloys, ceramics, and cermets. Operational requirements are as follows; sample temperature, approximately 300° to 3000F; heat dissipation from main and guard heaters, 1000-20,000 Btu/hr-ft^2; heat dissipation from auxiliary heaters, 0 - 15,000 Btu/hr-ft^2; Environments, air, argon, vacuum approximately 10^{-5} mm Hg; sample size, 12 in x 12 in square, 3/8 in to 2-1/2 in thick; accuracy, 1800°F within ± 5%, 3000°F within ±10%. In general these operational requirements were met with calibration runs on copper to 1800°F and Al_2O_3 to 3000°F falling within the prescribed accuracy limits. Further thermal conductivity tests were completed on René 41 honeycomb, titanium alloy honeycomb, L605 cobalt alloy honeycomb, stainless steel, René 41, and fused silica. A detailed discussion is made of instrumentation and materials compatability problems encountered during the testing program. (Author) (See also AD-283 049)

AD-423 555
Harry Diamond Labs., Washington, D. C.
A MECHANICAL POLISHING TECHNIQUE FOR SEMICONDUCTOR MATERIALS
R. B. Reams and C. H. Klute. 30 Oct 63, 21p
Rept. no. TR-1180; N64-12323
OTS $0.75

DESCRIPTORS: *Semiconductors, Surfaces, *Finishes and finishing, *Machine tools, Grinders, Design.

A method for obtaining a very finely polished surface on semiconductor wafers was devised. The mechanical arrangements include a polishing machine in which special care is used to continuously remove the abraded semiconductor particles from the polishing medium. The method uses only two major operations and yields a polished surface that is measurably smoother and flatter than the commercially polished specimens examined for comparison. (Author)

AD-421 807
Horizons, Inc., Cleveland, Ohio.
REINFORCEMENT OF NICKEL CHROMIUM ALLOYS WITH SAPPHIRE WHISKERS. Final rept., 28 Sep 62-27 Sep 63
Robert H. Kelsey. 25 Oct 63, 56p
Contract NOw 63-0138-c
N63-23517
OTS $1.50

DESCRIPTORS: *Composite materials, *Nickel alloys, *Chromium alloys, *Sapphires, *Iron, Aluminum compounds, Oxides, *Ceramic fibers, Oxygen, Bonding, Fiber metallurgy, *Whiskers (Single crystals)

It was found that a strong bond between alpha-alumina wool and iron may be formed by the addition of oxygen to the metal-fibril system in the form of naturally-occurring oxides of iron. Addition of oxygen through the furnace atmosphere was not found to be a practical method. Excess oxygen may be removed from the metal alumina wool composite by the addition of aluminum metal. Failure to remove excess oxygen results in degradation of the bond upon continued heating. The development of metal oxides on fiber surfaces and on sapphire plaques, followed by reduction in situ was not found to result in the wetting of sapphire by the subject metals. Nickel cladding of alumina fibers was not found to yield a strong bond. Evidences of wetting of alumina fibers with iron were seen when small amounts of iron oxide were reacted with the fiber surfaces. In amounts in the order of 0.5 $^{w}/_{o}$ on the fibers, wetting was observed; larger amounts inhibited wetting. (Author)
(See also AD 297 869)

AD-424 168
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A SYSTEM FOR MEASUREMENT OF CRYOGENIC THERMAL CONDUCTIVITY OF SOLIDS TO LIQUID NITROGEN TEMPERATURES (320°F). Rept. for May 62-May 63, on Materials Applications
M. L. Minges, J. M. Meiselman, and J. G. Broadus. Oct 63, 35p
ASD-TDR-63-756; N64-12636
OTS $1.00

DESCRIPTORS: *Cryogenics, Solids, *Thermal insulation, Styrene plastics, Halocarbon plastics, *Thermal conductivity, Measurement, *Calorimeters, Design, *Temperature control, Liquefied gases, Nitrogen.

The design, construction, and calibration of an apparatus for absolute thermal conductivity measurements at cryogenic temperatures is discussed. The method employed is a variation of the Wilkes Calorimeter utilizing liquid nitrogen as the cryogenic fluid. Calibration with Styrofoam (ρ = 2.0 lbs/ft^3) and TFE Teflon (ρ = 138 lbs/ft^3) over mean temperatures from -280°F to +20°F indicate agreement with published data within 5 percent. Heat leaks in the system varied between 4 and 13 percent. Details of automatic temperature control instrumentation and support equipment design are included. In addition, a review of various methods for absolute thermal conductivity determinations at cryogenic temperatures is presented. (Author)

SCDR-82-63
Sandia Lab., Albuquerque, N. Mex.
THE SPUTTERING OF CADMIUM COATINGS ON STEEL
D. M. Mattox and J. E. McDonald. Apr 63, 9p
Contract AT(29-1)789
OTS $1.10

DESCRIPTORS: *Steel, *Cadmium, *Coatings, *Sputtering.

AD-421 909
Space Sciences Lab., General Electric Co., Philadelphia, Pa.
INVESTIGATION OF BONDING IN OXIDE-FIBER (WHISKER) REINFORCED METALS. Quarterly rept. no. 4, 1 May-30 Jun 63
Willard H. Sutton. Jun 63, 29p
Contract DA36-034-ORD-3768RD
Technical rept. AMRA CR 63-01/4; N64-13998
OTS $0.75

DESCRIPTORS: *Ceramic fibers, *Cermets, *Reinforcing materials, Metals, Bonding, Adhesion, Oxides, *Whiskers (Single crystals), Aluminum compounds, *Nickel alloys, *Titanium alloys, *Chromium alloys, Mechanical properties, *Composite materials,

Sessile drop experiments were conducted on Ni, Ni-Ti and Ni-Cr compositions and α-Al_2O_3 single crystal plaques. The pure nickel drops reached equilibrium within 5 to 15 minutes after melting, while the contact angles of Ni-Ti and Ni-Cr drops continued to decrease with increasing time. In all cases, the addition of Ti and Cr decreased significantly the contact angles. In order to evaluate the adhesion between the solidified drops and the α-Al_2O_3 plaques, 'shear' tests were conducted. Fracture always occurred in the plaque, and examination of the interfacial region showed that the shear tests were unable to separate completely the α-Al_2O_3 from the Ni. The greatest 'shear' strength measured was 15,000 psi. The addition of Ti and Cr contributed significantly to the wetting of the Ni to the α-Al_2O_3. (Author) (See also AD-409 518)

AD-421 908
United States Rubber Tire Co., Indianapolis, Ind.
EMERGENCY REPAIR KIT FOR LARGE DIAMETER TUBELESS TIRES AND ROLLING-LIQUID TRANSPORTERS. Final rept., 21 Jun 61-20 Mar 63
A. S. Tavenor, ed. Aug 63, 53p
Contract DA44-177-TC-746
TRECOM Technical rept. 63-30
OTS $1.50

DESCRIPTORS: *Tool pits, *Maintenance equipment, *Tires, Rubber seals, Metal seals, Adhesives, Military requirements, Performance (Engineering)

The report briefly reviews the development of the metal-elastomer plug-type repairer, the design of clamp-type repairers for larger breaks and tears and the development of a self-curing repair gum; it also describes the subject kit as delivered to the U. S. Army Transportation Research Command. Details of the procedures for performing the repairs in the field are provided in a repair manual and are not included in this report. (Author)

AD-429 527 repriced
Watervliet Arsenal, N. Y.
a CLASSIFICATION OF MICROFIBERS, PART IV.
Technical rept.
M. A. Sadowsky and M. A. Hussain. Oct 63, 30p
Rept. no. WVT-RR-6317
OTS $0.75

DESCRIPTORS: *Composite materials, Elasticity, *Fibers, Mathematical analysis, Mathematical models, Equations, Stresses, Shear stresses, Tensile properties, Compressive properties, Deflection, Moments, Matrix algebra.

The delta-ring was put through the acceptance test with alpha = 3, and a linear inextensible, elastically flexible fiber was formed in the result. (Author)

Ceramics and Refractories

AD-421 816
Army Materials Research Agency, Watertown, Mass.
ANALYSIS OF A REFRACTORY COATING SYSTEM FOR THE THERMAL PROTECTION OF TITANIUM.
Rept. on Materials for Solid Propellant Rocket Motors
Raymond L. Farrow and Milton Levy. Sep 63, 25p
Technical rept. AMRA TR 63-13; N64-13850
OTS $0.75

DESCRIPTORS: *Refractory coatings, *Ceramic coatings, *Titanium, *Aluminum compounds, *Oxides, *Nickel alloys, *Chromium alloys, *Copper coatings, *Refractory metal alloys, *Refractory metals, Flame spraying, Adhesion, Porosity, Erosion, High-temperature research, Rocket motors (Solid propellant).

Metallic and ceramic refractory coatings are being considered to extend the useful life of titanium under conditions of high temperatures and erosive atmospheres. The effects of the refractory composite system of flame-sprayed Nickel-chrome, aluminum oxide, and copper, on the thermal characteristics of a titanium tube were investigated. The refractory composite system was examined metallographically for adhesion of coating to coating, and coating to substrate, porosity of coatings, and effect of deposition on the structure of the titanium substrate. A comparison of the weights of the composite titanium tube system and a similar size steel tube was made. A weight reduction of 19 percent was effected by the use of the coated titanium system. The advantages and disadvantages of each coating are discussed, and suggestions for future work are presented. (Author)

AD-422 039
Brussels Free Univ. (Belgium).
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XII. MASS SPECTROMETRIC DETERMINATION OF THE DISSOCIATION ENERGIES OF GASEOUS InS, In_2S AND In_2S_2.
Rept. for Jul 62-Jul 63, on Refractory Inorganic Non-Metallic Materials
R. Colin and J. Drowart. Sep 63, 28p
Contract AF61(052)225
WADD-TR-60-782, Part XII: N64-11171
OTS $0.75

DESCRIPTORS: *Refractory materials, Indium compounds, *Sulfides, Vaporization, Dissociation, Mass spectroscopy, Enthalpy, Ionization potential.

Investigation of the saturated vapor above InS, In_2S_3 and In_2S_3 + In samples and of the superheated vapor yielded: $In_2S(g)$, $2In(g) + 1/2S_2(g)$, $\Delta H^\circ_{298} = 98.2 \pm 5.0$ kcal/mole; $In_2S_2(g)$, $In_2S(g) + 1/2S_2(g)$, $\Delta H^\circ_{298} = 26.5 \pm 6.0$ kcal/mole; InS(g), $In(g) + 1/2S_2(g)$, $\Delta H^\circ_{298} = 17.4 \pm 4.0$ kcal/mole. Combining these data with $D^\circ_{298}(S_2) = 102.0 \pm 2.0$ kcal/mole one obtains: ΔH°_{298}(at. In_2S) = 149.2 ± 5.5; $D^\circ_{298}(InS) = 68.4 \pm 4.5$; ΔH°_{298}(at. In_2S_2) = 226.7 ± 8.0; D°_{298}(dim, InS) = 89.9 ± 11.0 kcal/mole. (Author) (See also AD-410 893)

AD-421 950
Brussels Free Univ. (Belgium).
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XIII. MASS SPECTROMETRIC STUDY OF THE SYSTEMS BORON-CARBON AND BORON-CARBON-SILICON. Rept. for Jul 62-Jul 63, on Refractory Inorganic Non-Metallic Materials
G. Verhaegen, F. E. Stafford, and J. Drowart. Sep 63, 28p
Contract AF61(052)225
WADD-TR-60-782, Part XIII; N64-11172
OTS $0.75

DESCRIPTORS: *Refractory materials, *Boron, *Carbon, *Silicon, Vaporization, Dissociation, *Mass spectroscopy, Vapor pressure, Ionization potential, Thermodynamics.

The systems B-C and B-C-Si were investigated mass spectrometrically. The atomication energy of the newly identified molecules BC_2, B_2C, BCSi, BSi_2, BC and BSi are 294, 254, 247, 174, 107 and 68 kcal/mole respectively. The atomization energy of SiC_2, Si_2C and SiC were redetermined. (Author) (See also AD-410 893)

AD-422 035
Brussels Free Univ. (Belgium).
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XIV. HIGH TEMPERATURE VAPORIZATION STUDIES. Rept. for Jul 62-Jul 63, on Refractory Inorganic Non-Metallic Materials
J. Drowart. Sep 63, 12p
Contract AF61(052)225
WADD-TR-60-782, Part XIV
OTS $0.50

DESCRIPTORS: *Vaporization, High-temperature research, Refractory materials, Thermochemistry, Mass spectroscopy, *Non-metals, Carbides, Oxides, Sulfides, Selenides, Tellurides, Chalcogens.

A brief summary of the mass spectrometric technique used to obtain thermochemical information at high temperatures is given, as well as data for a number of elements, alloys chalcogenides and carbides. (Author) (See also AD-278 830)

AD-422 458
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE DEBYE CHARACTERISTIC TEMPERATURE OF SOLIDS. Rept. on Refractory Inorganic Nonmetallic Materials
F. W. Vahldiek and A. M. Vahldiek. Sep 63, 23p
ASD-TDR-63-881; N64-12036
OTS $0.75

DESCRIPTORS: *Refractory materials, *Crystals, Thermodynamics, Specific heat, Resistance (Electrical), X-ray diffraction analysis, High pressure research, Anisotropy, *Graphite, Silicon compounds, Titanium compounds, Zirconium compounds, Hafnium compounds, Dioxides.

The Debye characteristic temperature as derived from Einstein's equipartition law is compared with frequency distribution functions of Born, Blackman and Lindemann. Debye θ values determined by mechanical and thermodynamic measurements for the rather simple elemental solids show differences. The following methods for deriving the Debye characteristic temperature for solids are discussed: specific heat, electrical resistance, X-ray diffraction, high pressure, mechanical and infrared. Debye temperature measurements for certain anisotropic and refractory solids such as SiO_2, TiO_2, and graphite have been included. An attempt was made to calculate the "average" Debye θ for ZrO_2 and HfO_2. (Author)

AD-422 032
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE USE OF INFRARED ABSORPTION SPECTROSCOPY IN RESEARCH ON HAFNIA AND ZIRCONIA. Rept. for Jan-Jun 63, on Materials Analysis Evaluation Techniques
William L. Baun and Neil T. McDevitt. Sep 63, 18p
ASD-TDR-63-789; N63-23663
OTS $0.50

DESCRIPTORS: *Refractory materials, Hafnium compounds, Zirconium compounds, Dioxides, Absorption spectrum, *Infrared spectroscopy, *Crystal structure, Crystal lattices, Impurities.

Infrared spectra are shown for monoclinic ZrO_2 and cubic stabilized ZrO_2 and HfO_2. Nine to ten bands in the region 800 - 200 cm^{-1} are reported for the monoclinic modification of each, while the stabilized cubic phases show only one broad band over the same frequency range. Both cubic and monoclinic ZrO_2 spectra are qualitatively similar to corresponding phases in HfO_2, but small differences in band position and shape make identification and separation possible in the monoclinic phase of these compounds. The spectrum of tetragonal ZrO_2 (CeO_2 stabilized) is identical to spectra obtained from cubic ZrO_2 samples. The strong dependence of the infrared spectrum on structure and lattice impurities is shown in the spectrum of a monoclinic specimen prepared by heating a low temperature stabilized sample at 800°C. (Author)

AD-423 667
Louvain Univ. (Belgium).
INHIBITION OF FLAME REACTIONS. Rept. for 1 Jul 61-30 Jun 63, on Flight Vehicle Hazard Protection
A. Van Tiggelen. Oct 63, 67p
Contract AF61(052)538
RTD-TDR-63-4011; N64-11462
OTS $1.75

DESCRIPTORS: *Flames, Inhibition, *Fire safety, Fire extinguishers, Powders, Fuels, Oxidizers, Flammability, *Fuel additives, Free radicals

The study of flame inhibition by dispersed solid particles was made in a constant flow system. Solid particles act both by a cooling effect and by a more specific surface destruction of the free radicals which propagate the chain reaction. A theoretical formula is proposed which allows the calculation of the necessary amount of powder which extinguishes the flame. A very good agreement with the experimental data is observed. Homogeneous inhibition by means of additives was investigated and more especially the behaviour of ternary mixtures (two fuels and one oxidizer or the reverse) at the flammability limits. The reciprocal influence of additives on the flammability limits is to be ascribed both to a temperature effect and to a more specific effect on the reaction kinetics; the substitution of more by less reactive chain carriers (free radicals) takes place. (Author)

AD-421 925
Naval Research Lab., Washington, D. C.
FILTERABILITY OF DISTILLATE FUELS. PART 2. EFFECT OF FUEL VISCOSITY AND RELATED FACTORS. Interim rept.
A. J. Chiantella and J. E. Johnson. 12 Sep 63, 22p
NRL rept. 5971; N64-15072
OTS $0.50

DESCRIPTORS: *Fuels, *Petroleum, Processing, Viscosity, Stability, Storage, *Aging (Materials), *Fuel filters, Porosity, Effectiveness.

Studies of additional factors influencing filterability of distillate fuels further substantiate the utility of a constant-head gravity-flow method for rating filterability. Quantitative relationships were made possible by selecting filter papers of uniform porosity. It was shown that the filterability of a distillate fuel contaminated by a given amount of sediment is directly proportional to the fuel viscosity. The effect of temperature on filterability was proven to be due to the variation of viscosity with temperature. Filterability is also directly proportional to the fuel pressure (head) on the filter. It was shown that variations in filter porosity could be balanced by proper adjustment of fuel head. No significant change in fuel viscosity was found due to aging, either normal or accelerated. It is proposed, therefore, that changes in fuel filterability due to aging are due to accumulation of insoluble residues in the fuel. (Author) (See also PB-161 966)

N63-13249
Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
INVESTIGATION OF ADVANCED HIGH ENERGY SPACE STORABLE PROPELLANT SYSTEM. Final rept., Jun-Nov 62
B.E. Dawson, A. F. Lum, and R. R. Schreib. [1962] 118p
Contract NASw-449
RMD-5507-F
OTS $9.60

DESCRIPTORS: *Propellant tanks, *Storage tanks.

AD-422 460
Rensselaer Polytechnic Inst., Troy, N. Y.
FURTHER DATA ON THE JUNCTURE CONDITION OF TEMPERATURE AT THE INTERFACE OF TWO BODIES IN SLIDING CONTACT. Rept. for 1 Feb-30 Apr 63, on Fundamental Research on Micromolecular Materials and Lubrication Phenomena
T. E. Simkins and S. L. Pu. Sep 63, 90p
Contract AF33(657)10058
ASD-TDR-63-627
OTS $2.25

DESCRIPTORS: *Lubricants, *Films, Friction, *Sliding contacts, Surface temperature, Measurement, Heat transfer coefficients.

In a previous report (AD-283 932) the measurement of point-wise juncture condition of temperature at the interface of two bodies in sliding contact was discussed. Further data have been accrued and are reported; the data include those with solid-film coated surfaces in sliding contact. Moreover, the temperature jumps were more thoroughly observed and a more detailed explanation of the phenomena is given. From experimental data, average contact heat-transfer coefficients are calculated. These values are compared with experimental data of contact, thermal resistance for static contact of smooth surfaces on rough surfaces. (Author)

AD-423 709
Rocketdyne, Canoga Park, Calif.
SUPPRESSION OF PENTABORANE FIRES AND EXPLOSIONS. Rept. for 15 Jul 62-14 Jul 63, on Checkout and Hazard Protection Techniques
R. J. Thompson, Jr. Sep 63, 87p
Contract AF33(657)9188
Rept. no. R-5302; RTD-TDR-63-4007; N64-12311
OTS $2.25

DESCRIPTORS: *Rocket propellants, *Pentaboranes, Storage, *Fire safety, Fires, *Explosions, Inhibition, Fire extinguishers, Shock tubes, *Decontamination, Iodides.

The prevention of pentaborane fires and explosions in air by chemical techniques were investigated by means of a diffusion burner and a heterogeneous shock tube. The results indicate chemical suppression of pentaborane-air-fires is practical. Studies on decontamination of pentaborane were also accomplished. (Author)

Plastics

AD-429 245 repriced
Army Engineer Research and Development Labs., Fort Belvoir, Va.
METHOD FOR COMPUTATION OF HIGH-RATE TENSILE STRENGTH OF PLASTICS FROM STATIC STRENGTH DATA
S. Goldfein. 15 Nov 63, 23p
Technical rept. 1759-TR
OTS $0.75

DESCRIPTORS: *Plastics, *Laminates, Tensile properties, Strength, Equations of state, Mathematical analysis.

The report covers an investigation to determine if the high-rate tensile strength of plastics can be calculated from the results of static strength tests at low temperatures. Nineteen plastics were investigated. A simplified version of a mechanical-chemical equation of state in conjunction with master rupture curves drawn from low-temperature test data was found to be all that was necessary to determine this property. The report concludes that: (1) High-rate tensile strength may be calculated from static strength data by means of a simplified versions of a mechanical-chemical equation of state. (2) Short-time strength in the elapsed time period of 3 to 13 milliseconds was found to be equivalent to the ultimate or static tensile strength at -32 F. (Author)

AD-422 324
Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
STUDIES OF THE THERMAL DEGRADATION OF TEFLON
Leo Reich, H. T. Lee, and David W. Levi. Sep 63, 32p
Technical rept. 3095; N63-23775
OTS $1.00

DESCRIPTORS: *Halocarbon plastics, *Reaction kinetics, Pyrolysis, Graphics.

Teflon 7 was thermally degraded in vacuum both at constant temperature and at a constant heating rate. Activation energies are reported. The reaction was found to be first-order throughout the temperature range investigated. Two new procedures for rapid treatment of kinetic data are reported, and the results are compared with conventional procedures. (Author)

Rubber and Elastomers

AD-422 466
Monsanto Research Corp., Dayton, Ohio.
EVALUATION OF ELASTOMERS AS O-RING SEALS FOR LIQUID ROCKET FUEL AND OXIDIZER SYSTEMS. Rept. for Sep 61-Mar 63, on Materials Evaluation
Carmen L. Bellanca, Ival O. Salyer, and Jay C. Harris. Sep 63, 79p
Contract AF 33(616)8483
ASD-TDR-63-496; N64-16870
OTS $2.00

DESCRIPTORS: *Fuel seals, *O-rings, Plastics, Elastomers, Encapsulation, Cladding, *Polyethylene plastics, *Halocarbon plastics, *Butyl rubber, *Silicones, Fuel systems, *Rocket propellants, *Oxidizers, Nitrogen compounds, Oxides, Chlorine compounds, Fluorides, *Hydrazine, *Dimethyl hydrazine (1-1), *Hydrogen peroxide

Elastomeric and plastic O-ring seals were exposed to liquid and vapor phases of nitrogen tetroxide, chlorine trifluoride, 1:1 mixture of hydrazine-unsymmetrical dimethylhydrazine, and 90% hydrogen peroxide under in-use conditions. Materials included polyethylene, Teflon, butyl, ethylene/propylene, Vitons A and B, silicone and others. To simulate service conditions, O-rings were tested under compression, in closed static systems, in direct contact with test fluid. The rate of fluid loss through the seal was determined directly. Test method and results are described. Polyethylene encapsulated O-rings and metal-clad elastomeric O-rings as seals for nitrogen tetroxide systems are also discussed. (Author)

AD-421 811
Wyandotte Chemicals Corp., Mich.
SYNTHESIS OF LOW TEMPERATURE OIL RESISTANT URETHANE ELASTOMERS. Annual rept., 1 Jul 62-30 Jun 63
S. L. Axelrood and W. J. Lajiness. [1963] 32p
Contract DA20-018-ORD-24883
OTS $1.00

DESCRIPTORS: Elastomers, *Isocyanate plastics, *Oils, Absorption, Synthesis (Chemistry), Low-temperature research, Amines, Ethers, Alcohols, Organic nitrogen compounds, Mechanical properties.

The preparation of polyether urethane elastomers is described and the effect of variation in formulation and processing on their properties. Special attention is given to low-temperature flexibility and to oil resistance. A number of diisocyanates, diamines, and polyether polyols were evaluated and their relative concentrations varied. There were comparatively small differences in the effect of type of diisocyanate and diamine on the low-temperature flexibility of the elastomers; however, they had a more pronounced effect on the oil resistance and mechanical strength, both at room and elevated temperatures. Introduction of ethylene oxide into the polyether chain decreased the oil absorption at the expense of increased water absorption. Lowering the concentration of the polar urethane and urea linkages and the cross links was the key factor in attaining low-temperature flexibility. However, this had an adverse effect on mechanical strength and oil resistance. These concentrations were lowered by the use of higher molecular weight polyols and reducing the relative concentration of diamine (NH_2/OH ratio). Large differences were observed in the low-temperature flexibility and other properties of the elastomers depending on the positioning of the cross links and polar linkages. (Author)

WAPD-T-1515
Bettis Atomic Power Lab., Pittsburgh, Pa.
ANOTHER ALTERNATING-DIRECTION-IMPLICIT METHOD
R. B. Kellogg. Jun 62, 7p
Contract AT(11-1)GEN-14
OTS $1.10

PB-165 290
Computing Center, Adelphi Univ. Garden City, N. Y.
A CONDITION FOR UNIFORM JORDANIZATION OF A FAMILY OF TRIANGULAR MATRICES
Mary Louise Buchanan. Feb 64, 24p
Grant NSF GP 1216
OTS $2.60

DESCRIPTORS: *Matrix algebra, Algebras, Difference equations, Theorems, Boundary value problems

The problem of the bounds of powers of a family of triangular matrices is approached in the following way: Conditions are examined for transforming a family $\mathfrak{F}$ of triangular matrices $A = (a_{ij})$ by uniformly bounded (in any matrix norm) similarity transformations S, such that $SAS^{-1} = B = (b_{ij})$, where $b_{ij} = a_{ij}$; $b_{i,i+1} = 0$ or 1; $b_{ij} = 0$, $j < i$, $j > i+1$. (Author)

TID-13809
Knolls Atomic Power Lab., Schenectady, N. Y.
INTERVAL ESTIMATION OF NON-LINEAR PARAMETRIC FUNCTIONS
Max Halperin. 8 Oct 61, 8p
Contract W31-109-eng-52
OTS $1.10

TID-14790
Knolls Atomic Power Lab., Schenectady, N. Y.
A NEW RULE FOR NUMERICAL INTEGRATION
Julius A. Archibald, Jr. 1 Nov 61, 11p
Contract W31-109-eng-52
OTS $1.60

UCRL-6612-T(Rev. I)
Lawrence Radiation Lab., Univ. of California, Livermore.
AN ANALYSIS OF FINITE DIFFERENCE APPROXIMATIONS FOR EQUATIONS OF STURM-LIOUVILLE TYPE
Milton E. Rose. Feb 62, 26p
Contract W7405-eng-48
OTS $2.60

DESCRIPTORS: Mathematics, *Boundary value problems, *Partial differential equations, *Difference equations

UCRL-6719-T
Lawrence Radiation Lab., Univ. of California, Livermore.
DIFFERENCE METHODS AND THE EQUATIONS OF HYDRODYNAMICS
W. F. Noh and M. H. Protter. [1962] 60p
Contract W7405-eng-48
OTS $5.60

DESCRIPTORS: *Hydrodynamics, Mathematics, *Partial differential equations, *Difference equations

UCRL-6920
Lawrence Radiation Lab., Univ. of California, Livermore.
FAST METHOD FOR COMPUTING THE NUMBER OF PRIMES LESS THAN AGIVEN LIMIT
David C. Mapes. 17 May 62, 29p
Contract W7405-eng-48
OTS $2.60

DESCRIPTORS: *Prime numbers, *Numerical methods and procedures, Tables, Identities

LADC-5344
Los Alamos Scientific Lab., N. Mex.
THE EIGENVALUE PROBLEM FOR SUBLINEAR HAMMERSTEIN OPERATORS WITH OSCILLATION KERNELS
George H. Pimbley, Jr. 22 Aug 62, 45p
Contract W7405-eng-36
OTS $4.60

LADC-5484
Los Alamos Scientific Lab., N. Mex.
A NOTE ON MULTIPLE MINIMA IN LEAST SQUARES
Roger H. Moore. 1962, 14p
Contract W7405-eng-36
OTS $1.60

DESCRIPTORS: *Least squares method, *Mathematical models.

LADC-5460
Los Alamos Scientific Lab., N. Mex.
REGULA FALSI FOR TWO VARIABLES
W. A. Beyer. [10 Oct 62] 20p
Contract W7405-eng-36
OTS $1.60

DESCRIPTORS: Mathematics, *Numerical analysis.

AD-424 142
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOLUTION OF A SECOND ORDER AND FIRST DEGREE ORDINARY LINEAR DIFFERENTIAL EQUATION OF THE TYPE $x^2 y'' = (y'; y; x)$. Rept. for Jul 62-Jul 63, on Nonmetallic and Composite Materials
William E. Gibbs. Sep 63, 14p
ASD-TDR-63-807
OTS $0.50

DESCRIPTORS: *Differential equations, Equations, Functions, Transformations (Mathematics), Numerical analysis, Polymers, Applied mathematics

The work concerns the solution of a differential equation encountered when treating analytically the thermodynamics and hydrodynamics of polymers in solution. (Author)

AD-423 435
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A STATISTICAL METHOD OF REDUCING RANDOM ERRORS IN DATA. Rept. for Jan-May 63, on Fundamental Research on Macromolecular Materials and Lubrication Phenomena
Pierce M. Williamson. Oct 63, 12p
RTD-TDR-63-4020; N64-17957
OTS $0.50

DESCRIPTORS: *Experimental data, Statistical data, *Errors, *Statistical analysis,

A method of modifying observed or calculated data to reduce random errors was devised. It is based on applying standard statistical calculations to sets of first order differences, the sets varying from each other by the length of intervals used. It is suitable for unrepeatable observations, rather than for laboratory experimental results, and for timewise non-cyclical numerical indexes. (Author)

TID-16893
Sandia Corp., Albuquerque, N. Mex.
TABLES OF SOME EXPECTED WEIGHTED COVERAGE FUNCTIONS
Stoughton Bell. [22 Oct 62] 75p
Contract AT(29-1)789
SCDC-2876
OTS $7.60

Computing Devices

AD-423 552
American Machine and Foundry Co., Alexandria, Va.
DESIGN OF AN ENCODER, CONVERTER, AND DISPLAY DEVICE. Rept. for 4 Sep 62-30 Apr 63
Sander Rubin. Oct 63, 175p
Contract AF33(657)9208
ASD-TDR-63-659
OTS $3.00

DESCRIPTORS: *Navigation computers, Airborne, *Input-output devices, *Display systems, *Computer logic, Circuits, Microminiaturization (Electronics), Packaging, Coding.

Communication between an airborne navigational computer and the navigator requires means for encoding decimally entered information, displaying output information, and converting between the binary notation of the computer and the decimal notation of the operator. A design is presented of a device which performs those functions. Conversion between binary and B.C.D. notation is accomplished by a fixed-program, special-purpose computer coupled to the navigational computer. Display devices for decimal digits are proposed based upon a small stepping motor with opto-electronic feedback to assure that the device is actually in the position called for. A complete logic design is presented. Suggested construction is of micro-miniature electronic blocks available now or in the near future. (Author)

WANL-TNR-063(Add. 1)
Astronuclear Lab., Westinghouse Electric Corp., Pittsburgh, Pa.
ACTIVATION SOURCE STRENGTH PROGRAM: ACT-II
P. C. Heiser and L. O. Ricks. [1962] 36p
Contract AT(30-1)3108
OTS $3.60

DESCRIPTORS: *Radioactivity, *Programming (Computers), Gamma rays.

AD-423 782
Catholic Univ. of America, Washington, D. C.
RESEARCH ON THE APPLICATION OF FERRO- AND FERRIELECTRIC PHENOMENA IN COMPUTER DEVICES
Charles F. Pulvari. Oct 63, 50p
Contract AF33(657)8871
RTD-TDR-63-4002
OTS $1.25

DESCRIPTORS: *Ferroelectric materials, Capacitors, *Computers, *Bismuth compounds, Oxides, Dielectrics, Switching circuits, *Computer logic.

The discovery of the ABO_3 type or perovskite type ferrielectrics (PB-161 805) exhibiting a threshold switching field and the valuable results gained during the first phase of this investigation permitted the extension of work to find new materials exhibiting similar properties. This led to the discovery of a second class of ferrielectrics, the MBO type or Mixed Bismuth Oxides type ferrielectrics, with highly useful electrical and technological properties. The objective of this research was to demonstrate that capacitor elements composed of ferrielectrics of the MBO type employed as a dielectric represent an important improvement as compared to ordinary ferroelectric capacitors and that they can be utilized as a computer logic device. Fabrication techniques of these ferrielectric devices are discussed. Certain applications have been explored such as the development of field controlled polarization transfer devices (Transpolarizers®). Ferri-resonance flip-flop devices and a shift register using these flip-flops are also presented. Finally, a non-contact readout method was investigated utilizing a novel vibrating electrode solid state electrometer. (Author)

TID-19018
Digital Computer Lab., Univ. of Illinois, Urbana.
HIGH-SPEED COMPUTER PROGRAM, PART I. ILLIAC II SYSTEM PROGRAMMING AND OPERATION, PART II. CIRCUIT RESEARCH PROGRAM, PART III. SWITCHING THEORY, PART IV. DATA REDUCTION METHODS, PART V. IBM 7090-1401 SYSTEM, PART VI. GENERAL LABORATORY INFORMATION, PART VII. Technical progress rept.
May 63, 47p
Contract AT(11-1)415
OTS $4.60

DESCRIPTORS: *Computers, Transistors effect, Light, Amplifiers, *Programming (Computers)

GEAP-3923
General Electric Co., San Jose, Calif.
RESONANCE INTEGRAL CALCULATIONS FOR EVALUATION OF DOPPLER COEFFICIENTS, THE RAPTURE CODE
J. H. Ferziger, P. Greebler, M. D. Kelley, and J. W. Walton. 12 Jun 62, 39p
Contract AT(04-3)189
OTS $3.60

DESCRIPTORS: Fast reactors, *Neutrons, *Resonance, *Programming (Computers)

HW-77279
Hanford Atomic Products Operation, Richland, Wash.
INTERSET: 7090 CODE FOR INTERACTION MATRIX SETUP AND SOLUTION OF ARBITRARY CYLINDRICAL VESSEL SYSTEMS
F. R. Czerniejewski. 15 Apr 63, 11p
Contract AT(45-1)1350
OTS $1.60

DESCRIPTORS: Neutron reactions, *Programming (Computers), *Reactor lattice parameters, Cylindrical bodies.

N64-17206
474 200
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TABLE OF PERIOD GENERATORS
L. D. Baumert. 1 Nov 62, 32p
Contract NAS7-100
Technical rept. no. 32-564; NASA CR-53207
OTS $3.60

DESCRIPTORS: Tables, *Control sequences, *Timing devices, Computers, Computer logic.

N64-17223
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
USERS' DESCRIPTION OF JPL EPHEMERIS TAPES
P. R. Peabody, J. F. Scott, and E. G. Orozco.
2 Mar 64, 29p
Contract NAS7-100
Technical rept. no. 32-580; NASA CR-53218
OTS $2.60

DESCRIPTORS: *Magnetic tape, *Celestial mechanics, Magnetic recording systems, *Digital computers, Astronomical data.

SCTM-247-59(15)
Sandia Corp., Albuquerque, N. Mex.
RAPID RETRIEVER: A REALIZABLE, HIGH CAPACITY HIGH SPEED, AUTOMATED INFORMATION RETRIEVAL SYSTEM
E. C. Dowling and W. K. Paulus. 5 Jun 59, 35p
Contract AT(29-1)789
OTS $3.60

AD-278 507
Stanford Electronics Labs., Stanford Univ., Calif.
A FOUNDATION FOR THE ANALYSIS OF ANALOG-ORIENTED COMBINED COMPUTER SYSTEM
D. J. Nelson. Apr 62, 179p
Contract Nonr-225(24)
Technical rept. no. 1002-1; SEL-62-069
OTS $12.50

DESCRIPTORS: *Analog-digital computers, Digital computers, Analog computers, Errors, Theory, Matrix algebra, Servomechanisms, Linear systems, *Nonlinear systems, *Digital differential analyzers, Analog-to-digital converters, *Input-output devices, Scalers, Amplifiers,

It is the purpose of the dissertation to advance the theory of errors in analog-type systems both conceptually and mathematically. The first chapters are primarily bibliographical in nature. The error concepts presented have their roots in matrix theory. In general, discussion is broken into two parts: true error and sensitivity to perturbations. The errors considered are those concerning the solution as a function of time and those concerning the location of the characteristic roots of the piecewise linear system. In order to properly evolve the concepts, linear systems are considered first with perturbations in parameters and initial conditions. The concepts thus developed are then expanded to include nonlinear systems. One chapter is devoted to the mechanics and analysis of deterministic errors in digital differential analyzers (DDA's). The result of this analysis is to resolve the error theory of DDA's to a point equivalent to that of standard analog systems. The final chapter is devoted to the presentation of the present state of thinking regarding combined systems, with an indication of work yet to be done, and suggested methods of attack. (Author)

MECHANICS

N64-17821
Allied Research Associates, Inc., Concord, Mass.
PLASTIC STABILITY OF SIMPLY SUPPORTED SPHERICAL PLATES UNDER EXTERNAL PRESSURE
C. Lakshmikantham and George Gerard. 15 Jan 64, 17p
Contract NASw-682
Tech rept. 235-2; NASA CR-53358
OTS $1.60

DESCRIPTORS: *Structural parts, *Buckling (Mechanics), Plasticity, Pressure, Spheres.

N64-17762

Allied Research Associates, Inc., Concord, Mass.
STABILITY OF SPHERICAL PLATES
G. Lakshmikantham and George Gerard. 15 Jan 64, 27p
Contract NASw-682
Tech. rept. 235-1; NASA CR-53318
OTS $2.60

DESCRIPTORS: *Spheres, Metal plates, Stability, Loading (Mechanics)

WAPD-T-1521
Bettis Atomic Power Lab., Pittsburgh, Pa.
CIRCULAR PLATES WITH ELASTICALLY BUILT-IN EDGES
F. J. Loss and W. J. O'Donnell. 18 Jun 62, 30p
Contract AT(11-1)GEN-14
OTS $2.60

HW-SA-2724
Hanford Atomic Products Operation, Richland, Wash.
MOTION-EXPANSION-VIBRATION
A. C. Rediske. [12 Aug 62] 8p
Contract AT(45-1)1350
OTS $1.10

N64-17224
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A GEOMETRICALLY NONLINEAR THEORY OF SHELLS
Bayard Wilson. 7 Nov 63, 58p
Contract NAS7-100
Technical rept. no. 32-584; NASA CR-53219
OTS $5.60

DESCRIPTORS: *Structural shells, *Tensor analysis, Theory.

N64-17792
Ling-Temeo-Vought, Dallas, Tex.
ON THE TURBULENT SHEAR FLOW OF AN ELASTICO-VISCOUS FLUID
C. S. Wells. Dec 63, 43p
Contract NASw-729
Rept. 0-71000/3R-28; NASA CR-53319
OTS $4.60

DESCRIPTORS: *Fluid flow, Turbulence, Elasticity, Viscosity.

Presented at the AIAA Aerospace Sciences Meeting, 20-22 January 1964, New York.

AD-426 360
LTV Vought Aeronautics, Dallas, Tex.
LOW CYCLE FATIGUE DESIGN DATA ON MATERIALS IN A MULTI-AXIAL STRESS FIELD. Final rept., Apr 62-Sep 63, on Materials Applications
S. W. McClaren and J. H. Best. Nov 63, 187p
Contract AF33(657)8525
RTD-TDR-63-4094; N64-13817
OTS $3.00

DESCRIPTORS: Aerospace craft, *Materials, Loading (Mechanics), *Statics, *Fatigue (Mechanics), Failure (Mechanics), Fractography, *Quality control

The biaxial characteristics of a leading group of aerospace materials were evaluated under static and fatigue conditions. The results of these evaluations are presented in light of the most prospective failure theories. In addition basic biaxial design data was established for this series of materials. The relationship between uniaxial and biaxial properties of materials are presented for static loading and low cycle repeated load applications. These comparisons employ the deformation energy for a static strength criterion while the fatigue data is compared on a basis of life versus state of stress. This study included basic notch toughness tests

and this data was combined with rating parameters of biaxial ductility, biaxial strength - weight ratios and biaxial fatigue life to establish a relative ranking of the program materials. (Author)

AD-425 013
Minnesota Univ., Minneapolis.
VISCOELASTIC SUPPORT DAMPING OF BUILT-IN CIRCULAR PLATES. Final rept., Jul 61-Jul 62, on Metallic Materials
T. J. Mentel and R. L. Schultz. Oct 63, 29p
Contract AF33(657)7453
ASD-TDR-63-648; N64-12049
OTS $0.75

DESCRIPTORS: *Damping, *Viscoelasticity, *Vibration isolators, Adhesives, Metal plates, Theory, Experimental data

An experimental and theoretical study is conducted of the damping effectiveness of an inset of viscoelastic adhesive at the supports of built-in circular plates. The experimental study shows that a small inset of adhesive can increase the total cyclic energy loss in the fundamental flexural mode by about a factor of five for plates made of aluminum alloy. The theoretical study shows that an elementary model of the dissipated action demonstrates qualitatively all of the characteristics observed experimentally. (Author)

AD-423 554
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
FLUID MECHANICS AND TANKAGE DESIGN FOR LOW GRAVITY ENVIRONMENTS. Rept. for Jun 61-Apr 63, on Electric Propulsion Technology
Robert G. Clodfelter. Sep 63, 59p
ASD-TDR-63-506
OTS $1.50

DESCRIPTORS: *Space propulsion, *Electric propulsion, *Liquid rocked propellants, *Propellant tanks, Design, *Weightlessness, Fluid flow, Drop testing, Mass transfer.

Electric propulsion systems for space vehicles must be able to restart and operate at zero and low gravity. This operation can be achieved if the tankage delivers only single-phase propellants. The requirements for feed systems of electric engines are described briefly. Also, the 1.85-second drop-test facility is described and the testing techniques are discussed. The minimum energy principle is presented along with a method for determining the direction of mass transfer in tapered tubes and liquid-vapor interface shapes in an annular space between concentric cylinders. Possible feed systems for electric engines are given, which utilize surface tension for fluid positioning and transfer. Zero-gravity and static-fluid configurations in cylindrical and spherical containers are discussed along with experimental observations. The interface "overshoot" of the equilibrium zero-gravity configuration is also discussed. (Author)

N64-17583
[William Marsh] Rice Univ., Houston, Tex.
THE MOVING GRIFFITH CRACK OF UNVARYING SHAPE
L. Manshinha. [1964] 19p
Grants NsG-6-59 and NSF G-14306
NASA CR-53181
OTS $1.60

DESCRIPTORS: *Fracture (Mechanics), Stresses, Distribution, Boundary value problems,

Aerodynamics and Pneumatics

N63-23009
Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
THE EFFECT OF FREE STREAM TURBULENCE AND VORTICITY ON THE RADIATIVE SOUND FIELD OF A FREE JET
Robert D. Smith. Aug 63, 78p
Grant NsG-31-60
ASRL TR-1013; NASA CR-51985
OTS $7.60

DESCRIPTORS: *Jets, *Nozzles, *Subsonic characteristics, Noise, Turbulence.

AD-423 580
Grumman Aircraft Engineering Corp., Bethpage, N.Y.
PRESSURE AND HEAT TRANSFER MEASUREMENTS FOR HYPERSONIC FLOWS OVER EXPANSION CORNERS AND AHEAD OF RAMPS. PART I: MACH 5 AND 8 DATA FOR EXPANSION CORNER FLOW. Part of an Investigation of Hypersonic Flow Separation and Control Characteristics
Louis G. Kaufman, II. Sep 63, 89p.
Contract AF33(616)8130
ASD-TDR-63-679, Part I; N64-12228
OTS $2.25

DESCRIPTORS: *Hypersonic flow, *Heat transfer, Pressure, *Wind tunnel models, Wedges, Flat plate models, Hypersonic characteristics, Schlieren photography

Pressure and heat transfer data were obtained for hypersonic flows over 40-degree expansion corners and ahead of ramps. Full and partial span ramps, having wedge angles up to 90 degrees, were tested at two locations on a sharp leading edge flat plate, with and without end plates. Pressure data were obtained for $M_\infty = 5$ for model length Reynolds numbers between 1.1 and 6.6 million. Both pressure and heat transfer data were obtained for $M_\infty = 8$ for Reynolds numbers between 1.1 and 3.3 million. (Author)

AD-422 031
Grumman Aircraft Engineering Corp., Bethpage, N.Y.
PRESSURE DISTRIBUTIONS AND OIL FILM PHOTOGRAPHS FOR MACH 5 FLOWS PAST FINS MOUNTED ON A FLAT PLATE. Part of an Investigation of Hypersonic Flow Separation and Control Characteristics
Louis G. Kaufman, II. Sep 63, 45p
Contract AF33(616)8130
ASD-TDR-63-755; N64-10539
OTS $1.25

DESCRIPTORS: *Hypersonic flow, Re-entry vehicles, *Wind tunnel models, Flat plate models, Wedges, *Fins, Hypersonic characteristics, Flow visualization, Photographic analysis, Pressure.

Pressure distributions and oil film photographs were obtained for Mach 5 flows past wedge shaped fins mounted on a sharp leading edge flat plate. Sharp and blunt leading edge fins of two different heights were tested for Reynolds numbers, based on the flat plate length, from 1.1 to 6.6 million. Data were obtained on both the fin and plate surfaces for model angles of attack between -5 and +10 degrees. (Author)

AD-431 280 repriced
Grumman Aircraft Engineering Corp., Bethpage, N. Y.
PRESSURE MEASUREMENTS FOR MACH 8 FLOWS OVER EXPANSION CORNERS AND RAMPS ON AN INTERNALLY COOLED MODEL. PART I: EXPANSION CORNER FLOWS. Part of an Investigation of Hypersonic Flow Separation and Control Characteristics
Louis G. Kaufman, II. Oct 63, 73p
Contract AF33(616)8130
RTD-TDR-63-4044, Part I; N64-16872
OTS $2.00

DESCRIPTORS: *Hypersonic flow, Aerodynamic configurations, *Aerodynamic characteristics, Pressure, Measurement, Wind tunnel models

Pressure distributions were obtained for Mach 8 flows over a sharp 40 degree expansion corner and ahead of ramps on an internally cooled model. Full and partial span ramps, having wedge angles up to 30 degrees, were tested at model angles of attack from -45 to 10 degrees for Reynolds numbers ranging from 1.1 to 3.3 million. The model wall temperature was maintained at fairly constant levels ranging from 450 to 1150 degrees Rankine. (Author)

N63-18491
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DETERMINING AERODYNAMIC HEATING RATES USING CALORIMETRIC MODELS IN THE JET PROPULSION LABORATORY HYPERSONIC WIND TUNNEL
E. A. Laumann. 7 Mar 63, 12p
Contract NAS7-100
Technical memo no. 33-121; NASA CR-50624
OTS $1.60

DESCRIPTORS: *Aerodynamic heating,

N64-17575
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HYPERSONIC BALLISTIC RANGE RESULTS OF TWO PLANETARY ENTRY CONFIGURATIONS IN AIR AND CARBON DIOXIDE/NITROGEN MIXTURES
Peter Jaffe. 31 Jan 64, 12p
Contract NAS7-100
Technical rept. no. 32-543; NASA CR-53232
OTS $1.60

DESCRIPTORS: *Aerodynamic configurations, Aerodynamic characteristics, Carbon dioxide, Nitrogen, Mixtures, *Hypersonic flight.

N64-17819
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
OBTAINING FREE-FLIGHT DYNAMIC DAMPING OF AN AXIALLY SYMMETRIC BODY (AT ALL ANGLES-OF-ATTACK) IN A CONVENTIONAL WIND TUNNEL
Peter Jaffe. 15 Jan 64, 43p
Contract NAS7-100
Technical rept. no. 32-544; NASA CR-53366
OTS $4.60

DESCRIPTORS: *Axially symmetric flow, *Aerodynamic characteristics, *Damping, *Wind tunnels, Models (Simulations), Angle of attack.

NASA-TN-D-2197
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
FREE-FLIGHT INVESTIGATION OF MASS-TRANSFER COOLING ON A BLUNT CONE TO A MACH NUMBER OF 10.6
Thomas E. Walton, Jr. Apr 64, 39p
N64-17746
OTS $1.00

DESCRIPTORS: *Blunt bodies, Aerodynamic heating, *Heat transfer, Flight testing.

NASA-TN-D-2204
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
LONGITUDINAL AERODYNAMIC CHARACTERISTICS AND SURFACE PRESSURE MEASUREMENTS FOR A 1/10-SCALE MODEL OF THE RAM B LAUNCH VEHICLE
Thomas C. Kelly and Robert J. Keynton. Apr 64, 40p
N64-17747
OTS $1.00

DESCRIPTORS: *Launch vehicles (Aerospace), Models (Simulation), Aerodynamic characteristics, Tests.

NASA-TN-D-2205
Langley Research Center, National Aeronautics and Space Administration, Langley Station, Va.
LOW-SPEED CHARACTERISTICS OF A 1/20-SCALE FOUR-ENGINE TRANSPORT MODEL WITH LARGE BODIES MOUNTED ABOVE THE FUSELAGE
Vernard E. Lockwood. Mar 64, 66p
N64-17748
OTS $1.75

DESCRIPTORS: *Transport planes, Models (Simulation), Aerodynamic characteristics.

N62-70858
Lewis Research Center, National Aeronautics and Space Administration, Cleveland, Ohio.
EFFECTS OF JET BILLOWING ON STABILITY OF MISSILE-TYPE BODIES AT MACH 3.85
Reino J. Salmi. Jun 60, 17p
NASA TN-D-284; AD-237 908
OTS $1.60

DESCRIPTORS: *Guided missiles, Configuration, *Aerodynamic characteristics

N63-22196
Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Ala.
WIND TUNNEL AND LABORATORY TESTS ON THE EDCLIFF 4-15 ANGLE OF PITCH AND YAW TRANSDUCER. Summary rept. 14 May 63, 50p
NASA TM-X-50866; MTP-AERO-63-34
OTS $4.60

DESCRIPTORS: Pitch (Motion), Yaw, *Transducers, Tests,

AD-423 707
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CONSIDERATIONS AND ANALYSIS OF A PROPOSED ELECTROSTATIC HYPERSONIC WIND TUNNEL. Rept. for Jun-Sep 63, on Electric Propulsion Technology
Kenneth E. Vickers and Gary Culp. Oct 63, 33p
RTD-TDR-63-4067
OTS $1.00

DESCRIPTORS: *Wind tunnels, *Hypersonic wind tunnels, Design, Electrostatic generators, Electric fields, Fluid flow, Acceleration, Atmosphere entry, Suborbital trajectories, Simulation

An analysis of the parameters concerning a proposed electrostatic wind tunnel for simulation of high velocities and high altitudes was undertaken. This hypersonic wind tunnel would provide a non-thermal means for simulating hypersonic flow in which the fluid is accelerated by the application of an electric field. Some of the problems involved with the concept, the development of the wind tunnel, and the possible limitations of the system are discussed. Requirements for the simulation of velocities between 10^2 and 10^4 m/sec at altitudes from 50 to 160 km are identified. Analysis of the proposed electrostatic wind tunnel suggests a lower limit for altitude stimulation in the range 75-100 km for velocities between 10^3 and 10^4 m/sec. Many problems are associated with the electrostatic wind tunnel concept which must be investigated and solved before feasibility may be established. Development of an operational facility using the concept proposed would greatly enhance atmospheric re-entry studies, as well as suborbital vehicle research. (Author)

AD-425 468
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF DETERMINING EFFECTS OF HEAT CONDUCTION IN LEADING EDGE OF WIND TUNNEL MODELS. Rept. for Aug 62-Apr 63
Linn E. Miller and Wilbur L. Hankey, Jr. Oct 63, 57p
RTD-TDR-63-4035; N64-12577
OTS $1.50

DESCRIPTORS: *Aerodynamic heating, *Heat transfer coefficients, Aerodynamic configurations, *Wind tunnel models, Integral transforms, Numerical analysis

A technique is developed for correcting heat transfer data for conduction effects in the vicinity of the leading edges of wind tunnel models. A solution is obtained by solving the general heat equation as applied to a cylindrical leading edge under a step heat impulse by means of Fourier and Laplace transforms. The local temperature is found to be a power series in time for thin skin models. By comparison of wind tunnel data with the theory developed herein it was ascertained that only three terms in the series (second degree curve in time) adequately represented the data. The coefficient of the linear time term is shown to be directly proportional to the applied heating rate. This theory is applied to several hypersonic wind tunnel tests and results in the elimination of large conduction errors in the heat transfer coefficient data. (Author)

N64-17816
William Marsh Rice Univ., Houston, Tex.
RESEARCH ON IONIZATION PHENOMENA IN HYPERSONIC WIND TUNNELS. Final rept., 1 Apr 59-1 Mar 64
Alan J. Chapman and Herbert K. Beckman. 1964, 39p
Grant NsG-3-59
NASA CR-53363
OTS $3.60

DESCRIPTORS: *Ionization, *Hypersonic wind tunnels, Gas flow.

METALLURGY

AD-429 221 repriced
Advanced Metals Research Corp., Somerville, Mass.
RESEARCH TO DETERMINE COMPOSITION OF DISPERSED PHASES IN REFRACTORY METAL ALLOYS. PART II. CONCENTRATION GRADIENTS IN REFRACTORY METAL BINARY DIFFUSION COUPLES. Rept. for 1 Jan 62-28 Feb 63, on Metallic Materials
Robert E. Ogilvie, Sheldon H. Moll, and Donald M. Koffman. May 63, 106p
Contract AF33(616)7671
ASD-TDR-62-7, Part 2
OTS $2.50

DESCRIPTORS: *Refractory metal alloys, *Diffusion, Theory, Niobium, Vanadium, Copper, Platinum, Tantalum, Microanalysis, Electron beams, Crystal structure, Crystal lattices, Molybdenum alloys, Titanium alloys, Zirconium alloys, Carbon alloys, X-ray diffraction analysis, Carbides, Titanium compounds, Zirconium compounds, Experimental data, Tables.

The concentration gradients present in pure metal and alloy incremental, two-component, diffusion couples were determined by means of electron beam microanalysis. In a parallel study the equilibrium chemistry of individual phases present in two-phase alloys of the Ta-Pt system was determined by means of electron beam microanalysis. The crystal structures, lattice parameters and chemistries of dispersed phase precipitates in two Mo-TZC alloys (1.6 Ti-0.58 Zr-0.13C) were determined. One alloy was as-extruded and the other as-swaged. The combined techniques of X-ray diffraction and electron beam microanalysis were employed. The phases were shown to be alloy carbides of the TiC and ZrC systems. (Author)

ANL-FGF-364
Argonne National Lab., Ill.
ROOM TEMPERATURE LATTICE CONSTANTS OF ALLOYS OF PLUTONIUM IN ALPHA-URANIUM
A. F. Berndt. 29 Jun 62, 19p
Contract W31-109-eng-38
UAC-6645
OTS $1.60

DESCRIPTORS: *Plutonium alloys, *Uranium alloys, Uranium, Crystal structure.

BMI-X-10041
Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF URANIUM MONONITRIDE.
Quarterly progress rept. for Jan-Mar 63.
Donald L. Keller. 1 Apr 63, 18p
Contract W7405-eng-92
EURAEC-651
OTS $1.60

DESCRIPTORS: *Uranium, *Nitrides

BMI-1664
Battelle Memorial Inst., Columbus, Ohio.
A STUDY OF THE TENSILE FRACTURE AND MICROSTRUCTURE OF URANIUM
Ellis L. Foster, Jr., ed. 14 Feb 64, 77p
Contract W7405-eng-92
OTS $2.00

WAPD-T-1427
Bettis Atomic Power Lab., Pittsburgh, Pa.
THE ANNEALING OF IODIDE HAFNIUM
J. G. Goodwin. 16 Mar 62, 28p
Contract AT(11-1)GEN-14
OTS $2.60

DESCRIPTORS: *Hafnium, Tensile properties, *Annealing

BRB-72
Bridgeport Brass Co., Conn.
QUARTERLY PROGRESS SUMMARY, JULY-SEPTEMBER, 1962. 9 Apr 63, 36p
Contract AT(30-1)1405
OTS $3.60

DESCRIPTORS: *Uranium, *Machining, Reactor fuel elements, Extrusion

AD-423 562
Defense Metals Information Center, Columbus, Ohio.
THE APPLICATION OF ULTRASONIC ENERGY IN THE DEFORMATION OF METALS. Rept. on an Informal Symposium
A. R. Rosenfield. 16 Aug 63, 81p
Contract AF33(616)7747
DMIC rept. 187; N64-13598
OTS $2.25

DESCRIPTORS: *Material forming, Material removal, Metals, Deformation, *Ultrasonic radiation, Cutting tools, Drawing (Machine processing), Extrusion, Rolling (Metallurgy).

On June 21, 1963 a symposium was sponsored by the Bureau of Naval Weapons on the application of ultrasonic energy in the deformation of metals. At this session, a number of investigators actively working in the field reported informally on the results of their research. The reports revealed that the results achieved by incorporating ultrasonic transducers into conventional metal-forming and-cutting operations are sufficiently promising that the technique merits further attention. Data are available to indicate that application of ultrasonic vibrations during metalworking can increase speeds, lower forces, and improve surface finishes. All of these results have been obtained without any observed difference in properties between ultrasonically and conventionally fabricated parts. During the meeting the use of this technique was demonstrated in many common forming operations (drawing, grinding, tapping, extrusion, rolling), mainly on materials with low yield strength and low creep resistance (zinc, lead, aluminum, etc.). There was no agreement as to the cause of the improved fabricability, both a lowering of the yield stress and a reduction of friction being suggested. Some details on design of experimental and pilot-plant equipment are given. A 75 item annotated bibliography is included. (Author)

AD-422 463
Defense Metals Information Center, Columbus, Ohio.
SOME OBSERVATIONS ON THE DISTRIBUTION OF STRESS IN THE VICINITY OF A CRACK IN THE CENTER OF A PLATE
L. R. Jackson. 18 Sep 63, 36p
Contract AF33(616)7747
DMIC memo. 178; N64-11761
OTS $1.00

DESCRIPTORS: *Metal plates, *Fracture (Mechanics), *Stresses, Distribution, Loading (Mechanics).

The primary purpose of the memorandum is to make the results of Neuber's stress analysis more readily usable by those engaged in evaluating the crack sensitivity of materials. In the course of developing this information several features were observed that are worthy of remark. (1) While the more intense effect of a crack dies out rapidly near the crack tip, a measurable effect does persist over a great enough area that strain gages could be used to determine the extent to which Neuber's analysis can be applied to granular materials like metals and alloys. (2) The results indicate that, except in the immediate vicinity of the crack tip, the stress field is quite insensitive to crack geometry. Experimentally, however, it was observed that the nature of the crack tip has a measurable effect on fracture loads and it has been found necessary to extend the length of artificial-machined cracks by means of fatigue cracks in order to bring out differences between materials that otherwise might not be apparent. This observation might mean that Neuber's attention to the boundary conditions at the surface of the crack may make his method of analysis a more suitable baseline for deducing the nature of real materials than other, more simple methods that do not fulfill boundary conditions in the immediate vicinity of the crack. (Author)

RFP-175
Dow Chemical Co., Denver, Colo.
PLUTONIUM HANDLING FACILITIES FOR RADIOGRAPHY
A. L. Dighton, J. C. Sampson, and W. D. Stump.
12 Apr 62, 22p
Contract AT(29-1)1106
OTS $2.60

DESCRIPTORS: *Radiography, *Plutonium, Handling.

GAT-T-1087
Goodyear Atomic Corp., Piketon, Ohio.
THE PRECISE AND ACCURATE DETERMINATION OF THE LATTICE PARAMETER OF TUNGSTEN USING THE LIKELIHOOD RATIO METHOD
Karl E. Beu. 29 Apr 63, 17p
Contract AT(33-2)1
OTS $1.60

HW-SA-2640
Hanford Atomic Products Operation, Richland, Wash.
MELTING BEHAVIOR IN THE SYSTEM UO_2-PuO_2
T. D. Chikalla. 13 Jun 62, 28p
Contract AT(45-1)1350
OTS $2.60

DESCRIPTORS: *Plutonium, *Uranium, *Oxides, Melting

AD-424 375
IIT Research Inst., Chicago, Ill.
THERMAL PROPERTIES OF REFRACTORY ALLOYS. Rept. for 1 May 62-31 May 63, on The Chemistry and Physics of Materials
J. C. Hedge, C. Kostenko, and J. I. Lang. 1 Jan 63, 140p
Contract AF 33(657)8810
ASD-TDR-63-597; N64-11471
OTS $2.75

DESCRIPTORS: *Refractory metal alloys, Thermal properties, *Heat resistant materials, Thermal conductivity, Specific heat, Thermal expansion, Niobium alloys, Molybdenum alloys, Tantalum alloys, Boron compounds, Carbides, Zirconium compounds, Nitrides, Beryllium compounds, Oxides,

The objective was the determination of the thermal properties of fifteen selected refractory materials. The materials investigated were boron carbide, zirconium nitride, spinel, beryllium oxide, six columbium alloys, three tantalum alloys, and two molybdenum alloys. The thermal conductivity, specific heat, and linear thermal expansion were measured from room temperature to the melting point, or 5000°F, whichever was lower. (Author

UCRL-10311
Lawrence Radiation Lab., Univ. of California, Berkeley.
PROGRESS IN UNDERSTANDING HIGH-TEMPERATURE CREEP
John E. Dorn. 18 Aug 62, 53p
Contract W7405-eng-48
OTS $5.60

DESCRIPTORS: *Creep, High temperature research.

UCRL-10433
Lawrence Radiation Lab., Univ. of California, Berkeley.
PURE DIFFUSIONAL MASS TRANSFER IN ZONE MELTING
W. R. Wilcox and C. R. Wilke. Aug 62, 31p
Contract W7405-eng-48
OTS $3.60

DESCRIPTORS: *Metals, *Mass transfer, *Zone melting.

LA-2751
Los Alamos Scientific Lab., N. Mex.
ELEVATED TEMPERATURE DIFFUSION BONDING OF TUNGSTEN TO TUNGSTEN UNDER PRESSURE
R. I. Batista, G. S. Hanks, and D. J. Murphy. Aug 62, 54p
Contract W7405-eng-36
OTS $5.60

NMI-2803
Nuclear Metals, Inc., Concord, Mass.
THE STUDY OF BETA TREATMENT OF URANIUM. Progress rept. for 1 Dec 60-30 Mar 61.
R. B. Russell. 21 Apr 61, declassified 29 Mar 62, 74p
Contract AT(30-1)1565
OTS $7.60

DESCRIPTORS: *Uranium, Reactor fuel elements, Grain structures (Metallurgy).

NMI-2806
Nuclear Metals, Inc., Concord, Mass.
THE STUDY OF BETA TREATMENT OF URANIUM. 1 Dec 61-31 Mar 62.
R. B. Russell and A. K. Wolff. 13 Apr 62, 41p
Contract AT(30-1)1565
OTS $4.60

DESCRIPTORS: *Uranium, Grain structures (Metallurgy).

AD-423 682
Rock Island Arsenal Lab., Ill.
HEAT RESISTANT CONVERSION COATINGS FOR STEEL. Interim rept.
Linden H. Wagner. 15 Aug 63, 12p
Rept. no. 63-3345; N64-11536
OTS $0.50

DESCRIPTORS: *Steel, Protective treatment, *Phosphate coatings, *Refractory coatings, *Corrosion inhibition, Zinc compounds, Cadmium compounds, Oxides, Phosphoric acids,

Zinc and cadmium oxides were dissolved in 75% phosphoric acid and used separately as stock phosphatizing solutions. They were diluted in the ratio of 1 to 4 and 1 to 8, by volume, or 1 to 15 by weight. Steel wool was dissolved therein to raise the iron content. Zinc and cadmium oxides were made into a slurry with water, converted to the nitrates and added as accelerators. Steel panels were processed in the baths from 30 to 60 minutes at 190 - 195°F to obtain conversion coatings. The panels were divided into two groups. One group was used as the control, the other was heated in an oven at 300°F to determine heat resistance at that tem-

perature. Both groups were evaluated by salt spray tests for their resistance to corrosion. It was found that cadmium coatings applied to the panels in the processing solutions, in the absence of iron and an accelerator, appeared to afford the best resistance to heat. (Author)

TID-16610
Sandia Corp., Albuquerque, N. Mex.
KINETICS OF HOMOGENEOUS OXIDE FILM FORMATION ON METAL CRYSTALS
A. T. Fromhold, Jr. [Sep 62] 26p
Contract AT(29-1)789
OTS $2.60

TID-16897
Savannah River Lab., Aiken, S. C.
A NOISE-REDUCING ENCLOSURE FOR A FOUR-DIE SWAGER
B. H. Butler. [24 Oct 62] 10p
Contract AT(07-2)1
OTS $1.10

DESCRIPTORS: *Forging, *Acoustic equipment

TID-18619
Syracuse Univ. Research Inst., N. Y.
INVESTIGATION OF SPECIFIC VOLUMES OF LIQUID METALS AND ALLOYS. PHASE EQUILIBRIA STUDIES OF ALKALI-ALKALINE EARTH METAL SYSTEMS. Combined rept. no. II, 1 Jun 62-31 Jul 63.
Frank A. Kanda and Douglas V. Keller. May 63, 62p
Contracts AT(30-1)2731 and AT(30-1)1910
OTS $6.60

DESCRIPTORS: *Liquid metals, Alloys, *Alkaline earth metals, Phase studies

AD-429 115 repriced
Westinghouse Electric Corp., Blairsville, Pa.
THE EXTRUSION, FORGING, ROLLING, AND EVALUATION OF REFRACTORY ALLOYS. Rept. for 1 Aug 62-31 May 63
G. A. Reimann, D.R. Carnahan, and J. A. Visconti. Dec 63, 108p
Contract AF33(616)8325
ASD-TDR-62-670, Part 2
OTS $2.50

DESCRIPTORS: *Refractory metal alloys, *Material forming, Tungsten alloys, Molybdenum alloys, Niobium alloys, Extrusion, Forging, Rolling (Metallurgy), Tensile properties, Hardness, Microstructure, Grain structures (Metallurgy), Processing,

Wrought bars of tungsten-base alloys were produced by extrusion of arc-cast billets under a variety of conditions. Billets of W+0.6Cb alloy were successfully extruded using temperatures between 3200 and 4200 F and reduction ratios between 3.9:1 and 8.3:1. A comparison was drawn between W+0.6Cb extrusions produced from material melted by four suppliers. Differences in material characteristics could be traced to electrode suppliers. The W-6Mo+2Cb alloy was extruded between 3400 and 4200 F using ratios from 4.1:1 to 7.4:1. Surfaces were generally fair to poor and internal cracks were discovered in many extrusions. Machining billets from 4-inch ingots instead of 3 1/2-in. ingots produced only a slight improvement in extrusion quality. (Author)

TID-18665
W. M. Keck Lab. of Engineering Materials, Calif. Inst. of Tech., Pasadena.
METASTABLE CLOSE-PACKED STRUCTURES IN SILVER-RICH BINARY ALLOYS WITH TIN, ANTIMONY AND SILICON. Technical rept. no. 14.
W. Klement, Jr. Apr 63, 8p
Contracts AT(04-3)221 and Nonr-220(30)
OTS $1.10

Ferrous Metals

AD-423 529
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELEVATED TEMPERATURE FATIGUE PROPERTIES OF D6AC HIGH STRENGTH STEEL. Rept. for Jan 60-Apr 63, on Materials Application
Sidney O. Davis. Oct 63, 31p
ASD-TDR-63-645; N64-11442
OTS $1.00

DESCRIPTORS: *Steel, Mechanical properties, *Fatigue (Mechanics). Stresses, Rupture, Tensile properties, Rocket cases.

A program was conducted to obtain complete stress versus number of cycles (S-N) curves for D6AC steel heat treated to an ultimate strength of 270 KSI. Tension-tension fatigue tests were conducted on notched and unnotched specimens at 75°, 450°, and 550°F for stress ratios of 1 and ∞. Tensile and stress rupture data was obtained in conjunction with the fatigue data. (Author) (See also AD-286 832)

AD-426 299
Research Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
MARAGING STEEL PROJECT REVIEW (NO. 3), HELD 24-25 JULY 1963, BILTMORE HOTEL, DAYTON, OHIO. Rept. on Materials Application
R. M. Dunco and E. A. Janning. Nov 63, 584p
RTD-TDR-63-4048
OTS $7.00

DESCRIPTORS: *Maraging steels, *Steel, Carbon alloys, Nickel alloys, Mechanical properties, Welds.

The report consists of a series of papers on the technical progress achieved on low-carbon, high-nickel, maraging steels up to July 1963. Information on microstructure, mechanical properties, forming, welding, forging and casting of maraging steels is given. The applicability of these steels to rocket motor cases is discussed. The influence of processing variables and fabrication processes on mechanical properties is given. Plate, in a variety of thicknesses, is extensively evaluated, and sheet to a lesser degree. Other aspects of maraging steel technology, such as the castability of maraging steel by the monoshell process and the use of maraging steel in elevated temperature airframe design, are examined. (Author)

Nonferrous (except light) Metals

AD-424 412
Defense Metals Information Center, Columbus, Ohio.
A TABULATION OF DESIGNATIONS, PROPERTIES, AND TREATMENTS OF TITANIUM AND TITANIUM ALLOYS
R. A. Wood. 15 Jul 63, 11p
Contract AF33(616)7747
DMIC memo. 171; DMIC memo. 10, revised; N64-11468
OTS $0.50

DESCRIPTORS: *Refractory metals, *Titanium, Refractory metal alloys, *Titanium alloys, Mechanical properties, Physical properties, Processing, Tables.

AD-426 033
North American Aviation, Inc., Downey, Calif.
DETERMINATION OF MECHANICAL AND THERMO-PHYSICAL PROPERTIES OF COATED REFRACTORY AND SUPERALLOY THIN SHEET
D. C. Root and C. H. Savage. Nov 63, 203p
Contract AF33(657)9416
Rept. no. SID 63-956; RTD-TDR-63-4068
OTS $3.50

DESCRIPTORS: *Heat shields, *Refractory coatings, *Refractory metal alloys, *Nickel alloys, Chromium alloys, *Niobium alloys, *Molybdenum alloys, *Foils, Tensile properties, Thermal stresses, Fatigue (Mechanics), Creep, Oxidation, Recrystallization, Impact shock.

The mechanical properties of foil gages of the D-36 and B-66 Columbium and TZM molybdenum alloys were determined in both the coated and uncoated conditions at temperatures through 2700 F. Superalloy foils Rene 41 and Hastelloy X were evaluated at temperatures through 1900 F without protective coating. The tests made on these alloys included tensile, notch tensile, fatigue, creep, thermal cycling, thermal shock dynamic modulus, oxidation, bend, recrystallization, simulated micrometeoroid impact and microstructural examination. Data resulting from these tests are given. In addition, furnace and strain measuring equipment used in this program are described. (Author)

AD-422 980
Research and Technology Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE EFFECTS OF ANNEALING AND GRAIN SIZE IN POWDER-METALLURGY TUNGSTEN. Rept. for Jun 61-Mar 63, on Metallic Materials
Friedrich G. Ostermann. Sep 63, 34p
ASD-TDR-63-676; N64-11769
OTS $1.00

DESCRIPTORS. *Powder metallurgy, *Tungsten, Heat treatment, *Grain structures (Metallurgy), Crystal lattices, Ductility, Brittleness, Transition temperature, Fracture (Mechanics), Tensile properties.

Mechanical properties of powder-metallurgy tungsten were studied at low temperatures. Particular emphasis was placed on the effects of annealing temperatures and grain size on the ductile-brittle transition behavior. While room-temperature hardness and grain size were little sensitive to temperature changes within the 1500° to 2300°C range, tensile behavior was markedly influenced. Variation of grain size was achieved by straining and annealing. Grain size effects were evaluated in terms of the Petch-analysis. The k_y - parameter was found to be 4.5×10^7 dynes/cm$^{3/2}$, and an effective surface energy of 11,000 ergs/cm^2 for crack propagation was determined. Fracture was at all times predominantly intergranular. The results of this investigation suggest that the high ductile-brittle transition temperature of tungsten is not sufficiently explained by strong dislocation-impurity atom interaction. (Author)

AD-422 025
TAPCO, Div. of Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
INVESTIGATION OF WELDABILITY OF ADDITIONAL COLUMBIUM ALLOYS. Rept. for 1 Jul 62-30 Jun 63, on Metallic Materials
J. M. Gerken and T. L. Fullerton. Oct 63, 150p
Contract AF33(657)9446
ASD-TDR-63-843; N64-11371
OTS $2.75

DESCRIPTORS: *Refractory metal alloys, *Niobium alloys, *Welding, *Arc welding, *Electron beams, *Spot welding, Microstructure, Aging (Materials), Ductility, Brittleness, Transition temperature, Coatings, Tensile properties,

The welding characteristics of four columbium alloys, FS-85, B-66, D-36 and Cb-752, in two thicknesses were the subject of this investigation. These alloys in sheet form were welded by the tungsten inert gas, electron beam and resistance spot welding processes. The welding variables of current, voltage, speed and environment were studied to determine their effects on weld properties and to correlate properties with weld microstructure. A study of the effect on weld ductility of post weld aging and applying an oxidation protective coating was included in this program. The effect of tungsten arc or electron beam welding these alloys was to increase the ductile to brittle transition temperature. The increase was greatest for B-66 and Cb-752 and least for D-36 and FS-85. Generally, electron beam welds in a given alloy were more ductile and slightly stronger than tungsten arc welds. Aging tungsten arc welds at 1800 and 2000°F caused an additional increase in transition temperatures. This effect was most pronounced for welds in B-66 and Cb-752. Spot welds were made in these alloys using long-time low-current welding sequences. This procedure was necessary to minimize bonding of the electrodes to the outer sheet surfaces. (Author) (See also AD-282 225)

Structural Metallurgy and Corrosion

ANL-6785
Argonne National Lab., Ill.
CORROSION EXPERIENCE WITH ALUMINUM POWDER PRODUCTS
J. E. Draley, W. E. Ruther, and S. Greenberg. Nov 63, 28p
Contract W31-109-eng-38
OTS $0.75

ORNL-TM-542
Oak Ridge National Lab., Tenn.
THE EFFECT OF IMPURITIES ON MECHANICAL TWINNING AND DISLOCATION BEHAVIOR IN BODY-CENTERED CUBIC METALS
J. O. Stiegler and C. J. McHargue. 28 May 63, 37p
Contract W7405-eng-26
OTS $3.60

DESCRIPTORS: *Niobium alloys, *Vanadium alloys, Physical properties

SCDC-2845
Sandia Corp., Albuquerque, N. Mex.
SPALL FRACTURE
C. Donald Lundergan. 1962, 25p
Contract AT(29-1)789
OTS $2.60

TID-16413
Savannah River Lab., Aiken, S. C.
TRANSMISSION ELECTRON MICROSCOPY OF URANIUM
C. L. Angerman. [22 Aug 62] 6p
Contract AT(07-2)1.
OTS $1.10

DESCRIPTORS: *Uranium, *Electron microscopy, Electrolytic polishing

GEAP-4165A
Vallecitos Atomic Lab., General Electric Co., San Jose, Calif.
GENERAL AND STRESS CORROSION OF HIGH NICKEL ALLOYS IN SIMULATED SUPERHEAT REACTOR ENVIRONMENT
W. L. Pearl and G. G. Gaul. Mar 63, 46p
Contract AT(04-3)189
OTS $4.60

DESCRIPTORS: *Stainless steel, *Nickel alloys, Stresses, *Corrosion.

AD-423 841
Westinghouse [Electric Corp.] Bloomfield, N. J.
PHYSICAL METALLURGY OF TUNGSTEN AND TUNGSTEN BASE ALLOYS. Interim rept., 1 Jun 62-30 Apr 63, on Metallic Materials
Heinz G. Sell, George H. Keith, Randolph H. Schnitzel, and N. Francis Cerulli. May 63, 116p
Contract AF33(657)8247
WADD-TR-60-37, Part IV: N64-11748
OTS $2.50

DESCRIPTORS: *Tungsten, *Tungsten alloys, Metallurgical analysis, Single crystals, Tensile properties, Carbon, Autoradiography, Thermochemistry, Hardening.

The strength properties of W-TaC, W-Ta_2O_5, W-ThO_2 and W-C (carburized) alloys were investigated at and below 1650°C. Carbides and oxides stabilize the worked (stress relieved) structure to higher temperatures and strengthening appears to be due primarily to work hardening. Recrystallized, the alloys, in general, are not stronger than pure tungsten. The tensile properties of single and worked single crystals of W-.25% Ta were studied from R.T. to 1600°C for a variety of conditions. The combined effect of both alloying and grain boundaries on strength was determined to be about 10,000 psi from 300 to 1600°C. Carburizing, heat treating and quenching has a large effect on the yield stress of W-.25% Ta single crystal between 300 and 1000°C. The effectiveness of a pack carburizing technique was evaluated by autoradiography. Also studied was the chemical stability of TaC and ThO_2 in W. TaC decarburizes readily above 2000°C and is easily reduced by WO_3 below 1000°C. ThO_2 is more stable up to 2650°C. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

TID-15266
Argonne National Lab., Ill.
FIRST-EXCITED STATE IN Mg^{26}
R. D. Lawson. 17 Jan 62, 3p
Contract W31-109-eng-38
UAC-6000
OTS $1.10

DESCRIPTORS: *Magnesium, *Isotopes, *Nuclear energy levels.

ANL-6812
Argonne National Lab., Ill.
LABORATORY INVESTIGATIONS IN SUPPORT OF FLUID BED FLUORIDE VOLATILITY PROCESSES: PART V. THE RADIATION CHEMISTRY OF PLUTONIUM HEXAFLUORIDE.
Martin J. Steindler, David V. Steidl, and Jack Fischer. Dec 63, 24p
Contract W31-109-eng-38
OTS $0.50

TID-7681
Atomic Energy Commission, Washington, D. C., Div. of Isotopes Development.
ISOTOPES TECHNOLOGY DEVELOPMENT PROGRAM. ANNUAL CONTRACTORS MEETING (5th) HELD IN WASHINGTON, D. C., DECEMBER 2-3, 1963. Feb 64, 68p
OTS $1.75

BNL-6258
Brookhaven National Lab., Upton, N. Y.
A NEUTRON DIFFRACTION STUDY OF 2-NITRO-BENZALDEHYDE AND THE C-H--O INTERACTION
Philip Coppens. Sep 62, 32p
Contract AT(30-2)GEN-16
OTS $3.60

TID-18577
Frick Chemical Lab., Princeton Univ., N. J.
CATALYTIC ACTIVITY AND NUCLEAR RADIATION
F. Nozaki, D. Stamires, and J. Turkevich. [May 63] 34p
Contract AT(30-1)937
OTS $3.60

DESCRIPTORS: *Aluminum, *Silicon, *Oxides, *Catalysts, *Radiation effects

N64-17822
General Motors Corp., Santa Barbara, Calif.
ESTIMATION OF THE COLLISION-INDUCED DISSOCIATION RATES OF DIATOMIC AND TRIATOMIC MOLECULES. Final rept.
C. Frederick Hansen. Feb 64, 40p
Contract NAS7-217
TR64-14; NASA CR-53345
OTS $3.60

DESCRIPTORS: *Dissociation, *Diatomic molecules.

HW-80213
Hanford Atomic Products Operation, Richland, Wash.
ACCURATE EIGENVALUE MATRIX TREATMENT OF GENERAL FISSILE INTERACTION
F. R. Czerniejewski. Dec 63, 32p
Contract AT(45-1)1350
N64-17704
OTS $1.00

UCRL-10399
Lawrence Radiation Lab., Univ. of California, Berkeley.
BOUNDARY EFFECTS IN ROTATING-PLASMA EXPERIMENTS
Wulf B. Kunkel, William R. Baker, Alexander Bratenahl, and Klaus Halbach. 2 Aug 62, 33p
Contract W7405-eng-48
OTS $3.60

DESCRIPTORS: *Plasma physics.

UCRL-11150
Lawrence Radiation Lab., Univ. of California, Berkeley.
A MEASUREMENT OF THE FORWARD DIFFERENTIAL CROSS SECTION FOR $\bar{p}$-p ELASTIC CHARGE-EXCHANGE SCATTERING AT 1.03 BeV/c USING THE 72-INCH HYDROGEN BUBBLE CHAMBER AS A NEUTRON DETECTOR
Alan Natapoff. Doctoral thesis. Dec 63, 120p
Contract W7405-eng-48
OTS $2.25

UCRL-10324
Lawrence Radiation Lab., Univ. of California, Berkeley.
MICROACTIVATION ANALYSIS FOR OXYGEN IN THE ACTINIDE METALS
Andre C. Demildt. 19 Jul 62, 15p
Contract W7405-eng-48
OTS $1.60

DESCRIPTORS: *Oxygen, Determination, Microanalysis, Radioactivation analysis, *Actinide series.

LAMS-3053
Los Alamos Scientific Lab., N. Mex.
A SEARCH FOR THE MOSSBAUER RESONANCE OF THE 137 KeV γ RAY OF Fe^{57}
T. A. Kitchens, W. A. Steyert, and R. D. Taylor.
24 Feb 64, 14p
Contract W7405-eng-36
OTS $0.50

LAMS-3013
Los Alamos Scientific Lab., N. Mex.
SOME LOW ENERGY NEUTRINO CROSS SECTIONS
Leon Heller. 1 Dec 63, 59p
Contract W7405-eng-36
N64-17239
OTS $1.50

MITNE-31
Massachusetts Inst. of Tech., Cambridge.
EQUILIBRIUM EXTRACTION CHARACTERISTICS OF ALKYL AMINES AND NUCLEAR FUELS METALS IN NITRATE SYSTEMS. Progress rept. no. 11, 1 Apr-31 Dec 62.
Edward A. Mason and Takashi Watanabe. 1 Apr 63, 31p
Contract W7405-eng-26
OTS $3.60

DESCRIPTORS: *Niobium, *Ruthenium, *Uranium, *Amines, Solvent extraction

TID-15343
Oak Ridge Gaseous Diffusion Plant, Tenn.
EVALUATION OF THE PERFORMANCE OF THERMAL DIFFUSION COLUMNS
Edward Von Halle. [1962] 4p
Contract W7405-eng-26
OTS $1.10

DESCRIPTORS: *Isotope separation, *Xenon, *Isotopes, *Thermal diffusion,

ORNL-TM-556
Oak Ridge National Lab., Tenn.
TABULATION OF THE NEUTRON TOTAL CROSS SECTION OF U^{233} FROM 0.07 TO 10,000 ev MEASURED WITH THE ORNL FAST CHOPPER
N. J. Pattenden and J. A. Harvey. 30 Apr 63, 34p
Contract W7405-eng-26
OTS $3.60

DESCRIPTORS: *Uranium, Isotopes, *Neutron cross sections, Tables

ORNL-TM-263
Oak Ridge National Lab., Tenn.
THE USE OF PHOSPHITE AND HYPOPHOSPHITE TO FIX RUTHENIUM FROM HIGH-ACTIVITY WASTES IN SOLID MEDIA
H. W. Godbee and W. E. Clark. 19 Jun 62, 18p
Contract W7405-eng-26
OTS $1.60

DESCRIPTORS: *Ruthenium, *Phosphites,

IDO-14625
Phillips Petroleum Co., Idaho Falls.
CHEMICAL PROCESSING TECHNOLOGY. Quarterly progress rept. Jul-Sep 63.
J. R. Bower, ed. 24 Feb 64, 51p
Contract AT(10-1)205
OTS $1.25

IDO-16954
Phillips Petroleum Co., Idaho Falls.
DOPPLER BROADENING OF THE TOTAL, FISSION, CAPTURE, AND SCATTERING NEUTRON CROSS SECTIONS OF Pu241
N. H. Marshall and O. D. Simpson. 16 Dec 63, 58p
Contract AT(10-1)205
N64-16941
OTS $1.25

WCAP-1700
Westinghouse Electric Corp., Pittsburgh, Pa.
ION-EXCHANGE WITH EQUILIBRIUM AND DECAY
P. Cohen and G. R. Taylor. Jan 61, 19p.
Contract AT(30-1)3064
OTS $1.60

DESCRIPTORS: *Ion exchange resins, Effectiveness

TID-18506
Yale Univ., New Haven, Conn.
THIRD ORDER REORIENTATION EFFECT IN HEAVY ION COULOMB EXCITATION
D. L. Lin and J. F. Masso. Apr 63, 23p
Contract AT(30-1)1807
OTS $2.60

DESCRIPTORS: *Ions, *Nuclei, *Cadmium, *Neon, *Isotopes.

Elementary Particles

CONF-46-41
Argonne National Lab., Ill.
(π^--p) CHARGE EXCHANGE SCATTERING AT ZERO DEGREES
P. Borgeaud, S. Brehin, and S. D. Warshaw. [1963] 12p Prepared in cooperation with Commissariat a l'Energie Atomique.
Contract W-31-109-eng-38
OTS $1.60

American Physical Society Meeting, Washington, D.C., Apr 63

TID-16612
Argonne National Lab., Ill.
PRODUCTION OF MESONS AND BARYONS WITH ANOMALOUS HYPERCHARGES
Suraj N. Gupta. Jun 62, 5p
Contract W31-109-eng-38
UAC-6579
OTS $1.10

DESCRIPTORS: *Mesons, *Alpha particles, *Baryons,

TID-16908
Argonne National Lab., Ill.
A UNIFIED SELECTION RULE WITH SYMMETRY BETWEEN STRONG AND WEAK INTERACTIONS
K. Hiida. Jun 62, 10p
Contract W7405-eng-36
UAC-6599
OTS $1.10

DESCRIPTORS: *Elementary particles, *Selection rules

BNL-7106
Brookhaven National Lab., Upton, N. Y.
ON THE ϕ MESON
P. L. Connolly, E. L. Hart, K. W. Lai, G. London, and G. C. Moneti. [31 Jul 63] 25p
Contract AT(30-2)GEN-16
OTS $2.60

DESCRIPTORS: *Mesons, *Protons.

TID-19142
Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.
DOUBLE PHASE REPRESENTATION OF ANALYTIC FUNCTIONS
Masao Sugawara (Purdue Univ.) and Yoichiro Nambu. [1963] 35p
Contract AT(11-1)264
OTS $3.60

DESCRIPTORS: Scattering, *Elementary particles, *Elastic scattering, Functions.

UCRL-10584(Rev.)
Lawrence Radiation Lab., Univ. of California, Berkeley.
AN APPROXIMATION METHOD FOR REGGE TRAJECTORIES AND ITS IMPLICATIONS ON THE SPIN-2 PARTICLE OF THE CHEW-FRAUTSCHI DIAGRAM
Akbar Ahmadzadeh and Ismail A. Sakmar. 20 Apr 63, 12p
Contract W7405-eng-48
OTS $1.60

DESCRIPTORS: *Scattering, *Elementary particles.

Instruments and Installations

TID-16186(Rev.)
Argonne National Lab., Ill.
CIRCUITRY FOR A HIGH ALTITUDE GAMMA SPECTROMETRY SYSTEM
Richard B. Keener. Feb 63, 18p
Contract W31-109-eng-38
OTS $1.60

DESCRIPTORS: *Nuclear radiation spectrometers, Circuits.

BNL-7148
Brookhaven National Lab., Upton, N. Y.
COSMOTRON CURRENT MARKER. Internal rept.
Vincent J. Kovarik. 19 Jun 63, 10p
Contract AT(30-2)GEN-16
OTS $1.10

DESCRIPTORS: *Particle accelerators, *Synchrotron.

BNL-6277
Brookhaven National Lab., Upton, N. Y.
OPTIMUM DESIGN OF AN ATOMIC BEAM MAGNETIC RESONANCE APPARATUS
Edgar Lipworth and Geral Minerbo. [12 Sep 62] 31p
Contract AT(30-2)GEN-16
OTS $3.60

DESCRIPTORS: *Magnetic resonance, *Detectors.

GEAP-4304
General Electric Co., San Jose, Calif.
IN-CORE INSTRUMENTATION DEVELOPMENT PROGRAM. DETECTORS FOR IN-CORE POWER MONITORING
R. A. DuBridge. Jun 63, 65p
Contract AT(04-3)189
OTS $6.60

DESCRIPTORS: Ionization chambers, Thermocouples, *Radiation monitors, *Power reactors.

HW-67376
Hanford Atomic Products Operation, Richland, Wash.
IN-CELL BETA-GAMMA MONITOR INSTRUCTION MANUAL
E. M. Sheen. 11 Nov 60, 10p
Contract AT(45-1)1350
OTS $1.10

DESCRIPTORS: *Beta particles, *Gamma rays, *Radiation monitors, Instruction manuals.

HW-SA-2664
Hanford Atomic Products Operation, Richland, Wash.
OZONE HAZARDS ASSOCIATED WITH THE OPERATION OF AN ELECTRON VAN DE GRAAFF ACCELERATOR
F. E. Adley, H. V. Larson, J. S. Loomis, L. T. Myers, and D. E. Wisehart. [3 Aug 62] 21p
Contract AT(45-1)1350
OTS $2.60

DESCRIPTORS: *Electron beams, *Nitrogen, *Ozone.

Annual Meeting of the Pacific Northwest Section, American Industrial Hygiene Association, Seattle, Wash., Aug 62

LAMS-2977
Los Alamos Scientific Lab., N. Mex.
A COMPARISON OF THE NEUTRON DOSE RATES OBTAINED WITH THE SINGLE-SPHERE INSTRUMENT, MULTISPHERE METHOD, AND HURST PROPORTIONAL COUNTER
Dale E. Hankins and Raymond A. Pederson. Jul 63, 23p
Contract W7405-eng-36
N64-18002
OTS $0.50

LAMS-2946
Los Alamos Scientific Lab., N. Mex.
HEALTH PHYSICS BIBLIOGRAPHY ON TRITIUM
Donald A. McKown, comp. 16 Jul 63, 87p
Contract W7405-eng-36
N64-18094
OTS $2.25

LADC-5476
Los Alamos Scientific Lab., N. Mex.
A "JUKE-BOX" SAMPLE CHANGER WITH PUNCHED-TAPE CONTROLLED SEQUENCING
C. G. Chezem and H. H. Helmick. [10 Oct 62] 16p
Contract W7405-eng-36
OTS $1.60

DESCRIPTORS: *Foils, *Detectors, *Magnetic recording systems.

LADC-5474
Los Alamos Scientific Lab., N. Mex.
WAVEGUIDE TAPERS
Bernard Hayes. [1962] 31p
Contract W7405-eng-36
OTS $3.60

DESCRIPTORS: Accelerators, Microwave equipment, *Waveguides

CONF-125-2
Midwestern Universities Research Association, Madison, Wis.
DESIGN OF A 720 Mev PROTON FFAG ACCELERATOR
F. T. Cole, G. Parzen, E. M. Rowe, S. C. Snowdon, and K. R. MacKenzie (California Univ.) Jun 63, 25p
Contract AT(11-1)384
OTS $2.60

DESCRIPTORS: Design, *Proton accelerators

Sector-Focused Cyclotron and Meson-Factory Conference, CERN, Geneva, Apr 63

TID-19030
Physical Sciences Lab., Saint Procopius Coll., Lisle, Ill.
A NEW ELECTROMETER OF HIGH SENSITIVITY
Francis R. Shonka, G. Failla, and John E. Rose. (Argonne National Lab.) [1963] 15p
Contract AT(11-1)323
OTS $1.60

DESCRIPTORS: *Electrometers.

DP-471
Savannah River Lab., Aiken, S. C.
AUTOMATIC DOSE COMPUTER FOR RADIATION FILM BADGES
John E. Davis. Apr 60, declassified 12 Mar 63, 13p
Contract AT(07-2)1
OTS $1.60

DESCRIPTORS: Dosimeters, *Densimeters, Analog computers, *Photographic film, *Detectors,

DPSPU-63-30-1
Savannah River Lab., Aiken, S. C.
HEALTH PHYSICS UTILIZATION OF AN IBM 1620 COMPUTER
J. R. Watts. May 63, 6p
Contract AT(07-2)1
OTS $1.10

DESCRIPTORS: *Health physics, *Digital computers.

KY-400
Union Carbide Nuclear Co., Paducah, Ky.
RADIATION STANDARDS & PRACTICES
R. W. Levin, comp. Nov 62, 10p
Contract W7405-eng-26
OTS $1.10

DESCRIPTORS: *Health physics, *Standards,

AMF-388-TR-3
AMF Atomics, Inc., Greenwich, Conn.
AMF ON-POWER REFUELING SYSTEM FOR A CANDU-TYPE REACTOR. Adapter valve development rept. Feb 63, 188p
Contract AT(38-1)233
OTS $13.00

DESCRIPTORS: *Reactor system components, *Heavy water reactors, Valves,

ANL-6798
Argonne National Lab., Ill.
A FAST REACTOR EXCURSION SIMULATOR
Lawrence T. Bryant and D. V. Gopinath. Dec 63, 30p
Contract W31-109-eng-38
OTS $0.75

ANL-6788
Argonne National Lab., Ill.
FISSION PRODUCT MONITORING IN EBR-I, MARK IV
R. R. Smith and C. B. Doe. Jan 64, 12p
Contract W31-109-eng-38
N64-17779
OTS $0.50

ANL-6860
Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM. Progress rept. for Feb 64.
R. M. Adams and A. Glassner. 15 Mar 64, 111p
Contract W31-109-eng-38
N64-17998
OTS $2.25

CONF-39-70
Argonne National Lab., Ill.
A STUDY OF THE REACTION OF ALUMINUM - URANIUM ALLOY FUEL PLATES WITH WATER INITIATED BY A DESTRUCTIVE REACTOR TRANSIENT
R. O. Ivins. Feb 63, 9p
Contract W31-109-eng-38
OTS $1.10

DESCRIPTORS: Reactor safety systems, *Reactor fuel plates, *Aluminum alloys, *Uranium alloys

American Nuclear Society Ninth Annual Meeting, Salt Lake City, Utah, Jun 63

NAA-SR-9265
Atomics International, Canoga Park, Calif.
HALLAM NUCLEAR POWER FACILITY. REACTOR OPERATIONS ANALYSIS PROGRAM. Semiannual progress rept. no. 2, 1 Mar-31 Aug 63.
D. K. Darley, O. G. Jenkins, C. L. Larson, P. H. McCann, and R. M. Mills. 1 Mar 64, 162p
Contract AT(11-1)GEN-8
OTS $2.75

BMI-X-10039
Battelle Memorial Inst., Columbus, Ohio.
FISSION-PRODUCT RELEASE FROM FUEL-ELEMENT CLADDINGS. Quarterly progress rept. for Jan-Mar 63.
Fitz R. Winslow, Thomas S. Elleman, George G. Cocks, Josef Bugl, and Arthur A. Bauer. 1 Apr 63, 17p
Contract W7405-eng-92
EURAEC-625
OTS $1.60

DESCRIPTORS: *Xenon, *Isotopes, *Reactor fuel cladding, *Fission product activity

BMI-1661(Del.)
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING JANUARY, 1964
Russell W. Dayton and Ronald F. Dickerson. 1 Feb 64, 64p
Contract W7405-eng-92
OTS $1.50

CUA-NE-26
Catholic Univ. of America, Washington, D. C.
SIMULATED NUCLEAR REACTOR VIBRATIONAL HEAT TRANSFER. Quarterly progress rept. 1 Aug-31 Oct 62. [21 May 63] 15p.
Contract AT(30-1)2655
OTS $1.60

DESCRIPTORS: *Heat transfer, *Transducers, Vibration, *Heat exchangers.

EURAEC-399
Compagnie Industrielle des Combustibles Atomiques Frittes, Corbeville (France)
EXTRUSION OF UO_2 ENRICHED TO 5.5% FOR IRRADIATION TEST IN VBWR REACTOR OF VALLECITOS. Final rept.
J. Mercier. [1962] 17p
Contract 075-61-11-RDF
OTS $1.60

DESCRIPTORS: *Powder metallurgy, *Uranium, *Oxides, *Reactor fuel elements,

NYO-10478
Dynatech Corp., Cambridge, Mass.
EVALUATION OF AUTOMATIC FLOW BALANCING DEVICE IN BOILING WATER REACTORS. Quarterly progress rept. for Dec 62-Mar 63.
R. L. Mela, D. A. Gall, E. F. Doyle, and J. A. O'Neil. Apr 63, 20p
Contract AT(30-1)2907
Rept. no. 379
OTS $1.60

DESCRIPTORS: *Boiling water reactors, Reactor control.

TID-7666
[European Atomic Energy Community, Brussels (Belgium).]
MINUTES OF CERAMIC FUELS MEETING HELD IN BRUSSELS, OCTOBER 3-5, 1962
[1962] 61p
EUR/C/4936/62e
OTS $6.60

DESCRIPTORS: *Reactor fuel elements, *Uranium, *Oxides, *Symposia, *Reactor fuels, Ceramic materials.

GEMP-81
General Electric Co., Cincinnati, Ohio.
REACTOR INSTRUMENTATION AND CONTROL PROGRESS REPORT NO. 81. Rept. for 1 Jan-29 Feb 64.
31 Mar 64, 27p
Contract AT(40-1)2847
OTS $0.75

GNEC-275
General Nuclear Engineering Corp., Dunedin, Fla.
DEVELOPMENT OF HYDRAULIC BALL (HY-BALL) CONTROL SYSTEM. Quarterly progress rept. no. 3, Jan-Mar 63, 29 Mar 63, 93p
Contract AT(38-1)207
EURAEC-641
OTS $8.60

DESCRIPTORS: *Reactor control.

HW-77935
Hanford Atomic Products Operation, Richland, Wash.
ANALYSIS OF BURNUP DATA FROM PRTR PU-AL FUEL ELEMENT NO. 5075
W. B. Henderson and F. G. Dawson. 18 Jun 63, 45p
Contract AT(45-1)1350
OTS $4.60

DESCRIPTORS: Aluminum alloys, Plutonium alloys, *Reactor fuel elements, Consumption.

HW-80158
Hanford Atomic Products Operation, Richland, Wash.
IN-REACTOR MONITORING OF ZIRCALOY-2 PRTR PRESSURE TUBES, PART III. Rept. for Jul-Nov 63.
P. J. Pankaskie. Dec 63, 21p
Contract AT(45-1)1350
OTS $0.50

HW-79290
Hanford Atomic Products Operation, Richland, Wash.
SPECIFICATIONS FOR SWAGE COMPACTED, MIXED OXIDE (UO_2-PuO_2), FUEL ELEMENTS FOR THE PRTR(MARK I-M)
1 Oct 63, 39p
Contract AT(45-1)1350
OTS $1.00

HW-79291
Hanford Atomic Products Operation, Richland, Wash.
SPECIFICATIONS FOR VIBRATIONALLY COMPACTED, MIXED OXIDE (UO_2)-PuO_2), FUEL ELEMENTS FOR THE PRTR(MARK I-L). 1 Oct 63, 38p
Contract AT(45-1)1350
N64-17703
OTS $1.00

LA-3045
Los Alamos Scientific Lab., N. Mex.
A FORMULATION FOR NUMERICAL SOLUTION OF THE INVERSE PROBLEM OF THE GENERALIZED REACTOR KINETICS EQUATIONS
J. W. Evans. Oct 63, 15p
Contract W7405-eng-36
OTS $0.50

LAMS-3057
Los Alamos Scientific Lab., N. Mex.
PLUTONIUM REACTOR FUEL DEVELOPMENT. Quarterly status rept. for period ending 20 Feb 64, Mar 64, 14p
Contract W7405-eng-36
OTS $0.50

LAMS-3054
Los Alamos Scientific Lab., N. Mex.
SOLID PLUTONIUM FUELS PROGRAM. Quarterly status rept., 1 Oct-31 Dec 63.
J. A. Leary, W. J. Maraman, W. N. Miner, and F. W. Schonfeld. Mar 64, 13p
Contract W7405-eng-36
N64-17755
OTS $0.50

NMI-7215DE
Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF RESTRAINT TUBES 128, 129 AND 136
E. F. Jordan. 16 Jul 62, 31p
Contract AT(30-1)1565
OTS $3.60

DESCRIPTORS: *Reactor fuel elements

ORNL-TM-534
Oak Ridge National Lab., Tenn.
CONDENSING FLOW IN FINNED, TAPERED TUBES
R. B. Korsmeyer. 1 May 63, 42p
Contract W7405-eng-26
OTS $4.60

DESCRIPTORS: *Potassium, Condensation

ORNL-TM-577
Oak Ridge National Lab., Tenn.
MAGNET DATA FOR REDESIGNED ORR CONTROL ROD MECHANISMS. INFORMATION SEQUENCE AND QUANTITATIVE ANALYTICAL FORM FOR COMMUNICATION BETWEEN MAGNETIC AND MECHANICAL MAN POWER
J. Foster. 23 May 63, 7p
Contract W7405-eng-26
OTS $1.10

DESCRIPTORS: *Reactor control, *Control rods, Research reactors.

CONF-39-60
Oak Ridge National Lab., Tenn.
RELEASE OF FISSION PRODUCTS BY THE IN-PILE BURNING OF IRRADIATED URANIUM CARBIDE-GRAPHITE FUEL
W. E. Browning, Jr., R. P. Shields, C. E. Miller, Jr., and B. F. Roberts. [1963] 13p
Contract W7405-eng-26
OTS $1.60

DESCRIPTORS: *Reactor fuel elements, *Fission products.

American Nuclear Society Ninth Annual Meeting, Salt Lake City, Jun 63

ORNL-TM-547
Oak Ridge National Lab., Tenn.
SPECIFICATIONS AND DRAWINGS FOR THE CONTROL RODS FOR THE EXPERIMENTAL GAS-COOLED REACTOR
J. H. Coobs, N. A. Brown, R. M. Evans, and G. M. Tolson. 29 May 63, 48p
Contract W7405-eng-26
OTS $4.60

DESCRIPTORS: *Gas cooled reactors, *Control rods

IDO-16812
Phillips Petroleum Co., Idaho Falls.
THE DESIGN OF A DYNAMIC CORROSION AND CHEMICAL CONTROL TEST LOOP AND PRELIMINARY OUT-OF-PILE TEST RESULTS
William F. Zelezny, ed. 12 Jul 63, 89p
Contract AT(10-1)205
N64-17840
OTS $2.00

NP-11526
Power Reactor Development Co. [Detroit, Mich.]
ENRICO FERMI ATOMIC POWER PLANT REVISED LICENSE APPLICATION, AEC DOCKET NO. F-16. PART B, VOLUME 7. SECTION VI. EVALUATION OF HAZARDS. Technical information and hazards summary rept. [1961] 128p
OTS $10.10

NP-10458(Vol. 8)
Power Reactor Development Co. [Detroit, Mich.]
ENRICO FERMI ATOMIC POWER PLANT REVISED LICENSE APPLICATION, AEC DOCKET NO. F-16. PART B. VOLUME 8. PROPOSED TECHNICAL SPECIFICATIONS. PART I: OPERATION AT LEVELS NOT IN EXCESS OF ONE MEGAWATT. PART II: OPERATION AT LEVELS NOT IN EXCESS OF 200 MEGAWATTS (PRELIMINARY DRAFT) [1961] 92p
OTS $8.60

NP-12999
Rural Cooperative Power Association, Elk River, Minn.
ELK RIVER REACTOR TECHNICAL SPECIFICATIONS
1 Jul 63, 89p
OTS $8.10

DESCRIPTORS: *Power reactors, Specifications,

DP-829
Savannah River Lab., Aiken, S. C.
CONTAMINATION AND DECONTAMINATION OF LOW TEMPERATURE, WATER-COOLED REACTORS. PART IV: DEPOSITION OF RADIONUCLIDES FROM REACTOR COOLANT
Anton B. Carlson. Nov 63, 52p
Contract AT(07-2)1
OTS $1.25

DP-870
Savannah River Lab., Aiken, S. C.
NONDESTRUCTIVE TEST OF CARBON BEDS FOR REACTOR CONTAINMENT APPLICATIONS.
Progress rept., Jun 62-Dec 63.
Albert H. Peters and David R. Muhlbaier. Feb 64, 19p
Contract AT(07-2)1
OTS $0.50

APED-4220
Vallecitos Atomic Lab., General Electric Co., San Jose, Calif.
PROPOSED TECHNICAL SPECIFICATIONS FOR THE VALLECITOS CRITICAL EXPERIMENT FACILITY. MIXED SPECTRUM CRITICAL ASSEMBLY. 1 Apr 63, 31p
SO-203
OTS $3.60

DESCRIPTORS: *Critical assemblies

Radioactivity

TID-18608
Arkansas Univ., Fayetteville.
RADIOACTIVE FALLOUT. Annual progress rept.
31 Dec 62, 84p
Contract AT(40-1)2529
OTS $8.10

DESCRIPTORS: *Fission products, Atmosphere, *Radioactive fallout, Rainfall

HW-77690
Hanford Atomic Products Operation, Richland, Wash.
METHODS USED TO ESTABLISH PERMISSIBLE CONCENTRATIONS OF RADIOISOTOPES IN FRESH AND SEA WATER
R. F. Foster. 24 May 63, 17p
Contract AT(45-1)1350
OTS $1.60

DESCRIPTORS: *Water supplies, *Sea water, *Radioactivity, Fishes

HASL-144
Health and Safety Lab., Atomic Energy Commission, New York.
FALLOUT PROGRAM. Quarterly summary rept., 1 Dec 63-1 Mar 64.
Edward P. Hardy, Jr., Joseph Rivera, and William R. Collins, Jr. 1 Apr 64, 305p
OTS $4.00

UCRL-10414
Lawrence Radiation Lab., Univ. of California, Berkeley.
SIMPLIFIED SHELL-MODEL ALPHA DECAY RATE CALCULATIONS NEAR pb^{208}
John O. Rasmussen. Aug 62, 27p
Contract W7405-eng-48
OTS $2.60

DESCRIPTORS: *Lead, *Isotopes, *Alpha decay

TID-16181
Savannah River Lab., Aiken, S. C.
CONTROL OF CONTAMINATION IN HIGH LEVEL CAVES AT THE SAVANNAH RIVER LABORATORY
R. C. Craft. [16 Jul 62] 12p
Contract AT(07-2)1
OTS $1.60

DESCRIPTORS: *Radiological contamination, Decontamination.

Waste Disposal

HW-76973(Rev)
Hanford Atomic Products Operation, Richland, Wash.
DENITRATION OF PUREX WASTES WITH SUGAR
L. A. Bray. Apr 63, 21p
Contract AT(45-1)1350
OTS $0.50

HW-73672
Hanford Atomic Products Operation, Richland, Wash.
DISPERSION OF 300 AREA LIQUID EFFLUENT IN THE COLUMBIA RIVER
G. E. Backman. 25 May 62, 20p
Contract AT(45-1)1350
OTS $1.60

DESCRIPTORS: *Radioactive waste, *Disposal

HW-80526
Hanford Atomic Products Operation, Richland, Wash.
RESEARCH AND DEVELOPMENT ACTIVITIES. FIXATION OF RADIOACTIVE RESIDUES. Quarterly progress rept. Oct-Dec 63.
E. R. Irish, ed. Jan 64, 31p
Contract AT(45-1)1350
OTS $0.75

ORNL-TM-559
Oak Ridge National Lab., Tenn.
ESTIMATED COSTS FOR MANAGEMENT OF HIGH-ACTIVITY POWER REACTOR PROCESSING WASTES
J. O. Blomeke, J. J. Perona, R. L. Bradshaw, and J. T. Roberts. 13 May 63, 21p
Contract W7405-eng-26
OTS $2.60

IDO-14626
Phillips Petroleum Co., Idaho Falls.
ANALOG SOLUTION OF A MODEL OF THE SOURCES OF ELUTRIATABLE FINES IN THE FLUIDIZED BED CALCINATION PROCESS
Earl S. Grimmett. 28 Feb 64, 26p
Contract AT(10-1)205
OTS $0.50

IDO-14618
Phillips Petroleum Co., Idaho Falls.
DEVELOPMENT OF A FLUIDIZED BED CALCINATION PROCESS FOR ALUMINUM NITRATE WASTES IN A TWO-FOOT-SQUARE PILOT PLANT CALCINER. PART III: INTERMEDIATE PROCESS STUDIES, RUNS 11 THROUGH 22
B. P. Brown, B. M. Legler, B. R. Wheeler, E. S. Grimmett, and J. A. Buckham. 10 Feb 64, 131p
Contract AT(10-1)205
OTS $2.50

PHYSICS

TID-14713
Argonne National Lab., Ill.
TREATMENT OF ZEEMAN AND HYPERFINE ANISOTROPY IN ELECTRON PARAMAGNETIC RESONANCE
J. A. McMillan. Nov 61, 26p
Contract W31-109-eng-38
UAC-5812
OTS $2.60

DESCRIPTORS: *Molecules, *Ions, *Magnetic resonance,

AD-423 909
Space Sciences Lab., General Electric Co., King of Prussia, Pa.
INVESTIGATION OF NON-THERMAL IONIZATION FOR MHD ENERGY CONVERSION
B. Hoffman and F. H. Shair. Oct 63, 199p
Contract AF33(657)8298
RTD-TDR-63-4071, Part I
OTS $3.00

DESCRIPTORS: *Energy conversion, *Magnetohydrodynamics, Generators, Life expectancy, Temperature control, Electric fields, *Rankine cycle, Brayton cycle, Alkali metals, *Cesium, Helium group gases, *Helium, *Argon, *Space propulsion, *Electric power production.

The report describes a theoretical and applied research program directed toward prolonging the lifetime of magnetohydrodynamic (MHD) energy converters by reducing the necessary operating temperatures to the range 1000° - 2000°K. The process of interest is the use of the magnetically induced electric field in the MHD generator for electrical breakdown of appropriate working fluids. Work was directed toward the use of alkali metals for Rankine (vapor) cycles (although the results are applicable to Brayton cycles with certain nuclear reactors) and alkali metal seeded noble gases for studying the basic parameters of the breakdown. (Author)

Electricity and Magnetism

AD-420 237
Indiana General Corp., Valparaiso.
A MODIFIED SANFORD-BENNETT HIGH-H PERMEAMETER. Final rept. on Applied Research in Electrical, Electronic and Magnetic Materials
R. K. Tenzer. May 63, 11p
Contract AF33(657)8499
ASD-TDR-63-421
OTS $0.50

DESCRIPTORS: *Permeameters, *Magnets, Hysteresis, Magnetic properties, Probes (Electromagnetic), Fluxmeters, Measurement.

A Sanford-Bennett High-H permeameter was modified to also measure permanent magnets having high coercive forces and short lengths. Hall probes are used to measure field H and compensated coils are used to measure intrinsic induction (B-H). The application of tapered Fe-Co pole pieces enabled magnetizing fields over 20 kilogauss to be reached in narrow gaps. An ideal fluxmeter is used to shorten the measuring time with only a slight reduction in accuracy. (Author)

AD-420 234
Indiana General Corp., Valparaiso.
SURFACE INVESTIGATIONS ON PERMANENT MAGNETS. Final rept. on Applied Research in Electrical, Electronic and Magnetic Materials
K. J. Kronenberg and R. E. Quear. May 63, 29p
Contract AF33(657)8499
ASD-TDR-63-424
OTS $0.75

DESCRIPTORS: *Magnets, Electron microscopy, Surface properties, Microstructure, *Iron alloys, Manganese alloys, Colloids, *Magnetic materials, *Cobalt alloys, Mercury, Lead, Binders, Powder metals, Material forming.

Several types of magnets of iron, cobalt and iron-cobalt particles were made with different matrix materials. Magnets pressed from a gel of magnetic particles and mercury were used to evaluate the progress of the various phases of the process. In order to eliminate the mercury these magnets were distilled at high temperatures under a vacuum for several hours. This operation resulted in the production of porous blocks of fine particles which were either vacuum impregnated with resins or crushed, mixed with binder and repressed. Also, lead was added to the heat treated gel before pressing. These magnets were distilled, crushed and repressed. In addition, magnets have been made by superficially oxidizing submicron particles of iron-cobalt. The oxidized particles readily separate themselves from the mercury and are then mixed with binder and pressed into magnets. Gross structure in fine particle magnets was revealed by electron micrographs. An evaluation of the submicron particle research indicated that more effort should be made to produce stick-like particles of iron-cobalt. (Author)

AD-420 235
Indiana General Corp., Valparaiso.
TEMPERATURE EFFECTS ON THE REMANENCE OF PERMANENT MAGNETS. Final rept. on Applied Research in Electrical, Electronic and Magnetic Materials
R. K. Tenzer. May 63, 17p
Contract AF33(657)8499
ASD-TDR-63-500; N64-17463
OTS $0.50

DESCRIPTORS: *Magnetic materials, *Magnets, Aluminum alloys, Nickel alloys, Cobalt alloys, Copper alloys, Iron alloys, Magnetic properties, Temperature, Stability

Effects of temperature on the remanence of commercially produced permanent magnets have been measured. Alnico II, III, IV, V, VI, VIII, Indox I and V, and Cunife magnets have been investigated with regard to reversible, irreversible and material effects between -65 and +550°C. Results are shown in diagrams and tables. Alnico V, VI and VIII magnets have performed best in this range. (Author)

Electronics

AD-421 806
Electronics Research Lab., Univ. of California, Berkeley.
DIATOMIC GAS OPTICAL MASER WITH EXPLODING WIRE PUMPING SOURCE
L. Hajdu. 5 Jun 63, 41p
Grant DA-ARO(D)-31-124-G317; Contract AF49(638)102
Rept. no. 63-12; AROD-3323:3; N63-23167
OTS $1.25

DESCRIPTORS: *Diatomic molecules, *Gases, *Masers, *Lasers, Exploding wires, Pumping (Electronics), Sources, *Photochemistry.

The feasibility of a gaseous maser in which the excited atoms are produced through photochemical decomposition of diatomic molecules (such as N, O and NO) is studied. As an example, the photodissociation of NO is discussed in detail. The calculations indicate that light oscillation may be achieved at 7468.8 A and 8446 A wavelengths, corresponding to the atomic transitions NI (3p 4S sub 3/2 ⟶ 3s 4P sub 5/2 and OI (3p3P sub 2 ⟶ 3s3S sub 1), respectively. Because of the required high excitation energies, the useful pumping band of such a system is in the extreme ultraviolet. Exploding wire is suggested as a suitable light source, having very intense output in the vacuum ultraviolet, with excellent reproducibility of its spectral characteristics per flash. Preliminary experiments show that when N and O molecules are photoactivated by the light output of an exploding wire, the 7468.8 A Nitrogen and 8446 A Oxygen emission lines appear with relatively high intensities. (Author)

UCRL-6631
Lawrence Radiation Lab., Univ. of California, Livermore.
SINGLE-STREAMING AND CONTRA-STREAMING INSTABILITIES IN A RESISTIVE BACKGROUND
Charles K. Birdsall. 24 May 62, 41p
Contract W7405-eng-48
OTS $4.60

DESCRIPTORS: Fluid flow, *Plasma physics.

N64-17352
Plasma Dynamics Research Lab., Univ. of Texas, Austin.
PROPAGATION AND DISPERSION OF HYDROMAGNETIC AND ION CYCLOTRON WAVES IN PLASMAS IMMERSED IN MAGNETIC FIELDS. Semiannual status rept. no. 2, 15 Jul 63-14 Jan 64
Arwin A. Dougal. 15 Jan 64, 30p
Grant NsG-353
NASA CR-53229; includes N64-17353-17355
OTS $2.60

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, *Cyclotron waves, Propagation, Scattering.

N64-17222
RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
VAPOR-FILLED THERMIONIC CONVERTERS. Final rept.
K. G. Hernqvist, J. R. Fendley, H. Hendel, and J. D. Levine. Dec 63, 55p
Contract NAS3-2531
NASA CR-54009
OTS $5.60

DESCRIPTORS: *Thermionic converters, Electrons, Thermionic emission.

AD-425 991
Watkins-Johnson Co., Palo Alto, Calif.
APPLIED RESEARCH ON TECHNIQUES FOR LIGHT MODULATION DETECTION. Rept. for Jul 62-Sep 63
S. E. Sobottka. Sep 63, 52p
Contract AF33(657)8996
RTD-TDR-63-4137
OTS $1.50

DESCRIPTORS: *Phototubes, *Microwave equipment, Electron guns, *Light, *Modulation, *Detection, Cathodes (Electron tubes), Microwaves, Electric fields, Magnetic fields, Electrostatic fields, Helixes, Electron beams, Manufacturing methods.

A convergent gun microwave phototube was designed and partially developed in this program. A design which solves the problem of preserving the signal on the electron beam between cathode and helix was made, and depends on a laminar convergent flow achieved by using a convergent magnetic field, and electrostatic fields which accelerate electrons along magnetic field lines. It was shown that there is negligible conversion of density modulation to velocity modulation of the beam in the gun region by utilizing general principles which were taken from the theory of low-noise electron guns. It is shown that convergent gun phototubes will be superior to linear gun phototubes when a large cathode is needed to provide greater light collection area, such as when an incoherent light source is used, and when a large angular aperture is needed to receive the signal from a coherent light source. Techniques for fabricating phototubes with semi-transparent photocathodes were developed, especially a method for transferring a finished cathode from its forming vessel to the tube. Shot noise output measurements were made on a completed tube, these measurements agreeing with calculated values. (See also AD-293 149)

Molecular Physics and Spectroscopy

LADC-5771
New Mexico Univ., Albuquerque.
A THEORETICAL AND "EXPERIMENTAL" INVESTIGATION OF ONE-DIMENSIONAL MOLECULAR DISTRIBUTION FUNCTIONS
Samuel Blackman. Master's thesis. 1963, 66p.
OTS $6.60

DESCRIPTORS: *Molecules, Particles, *Thermodynamics.

AD-426 291
Ohio State Univ. Research Foundation, Columbus.
INVESTIGATION OF ATMOSPHERIC IMPURITIES. Final rept.
L. Carlton Brown and Dudley Williams. Nov 63, 49p
Contract Nonr-495(10)
RF Proj. 656
OTS $1.25

DESCRIPTORS: *Magnetic resonance, *Nuclear magnetic resonance, *Bacteria, *Amino acids, *Air pollution, Spectrum analyzers, *Biological contamination.

The report summarizes the work done in studying the possible application of magnetic resonance phenomena -- both NMR (nuclear magnetic resonance) and ESR (electron spin resonance) - in providing a method of detecting small quantities of airborne biological impurities such as bacteria. The report is devoted primarily to the use of ESR techniques.

Optics

AD-425 706
Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
RING LASER TECHNIQUES FOR ANGULAR ROTATION SENSING. Presented at ASD 1963 Science and Engineering Symposium held at Wright-Patterson Air Force Base, Ohio, 18-19 September 1963
D. A. Guidice and W. L. Harmon. Sep 63, 43p
ASD-TDR-63-694; N64-14316
OTS $1.25

DESCRIPTORS: Rings, *Lasers, Rotation, Momentum, Measurement, *Optics, *Symposia.

The concept of using a "ring" laser to measure angular rotation is presented. The optical frequencies of the clockwise and the counterclockwise beams traveling around the perimeter of the square "ring" depend on their respective optical path lengths which are equal in the absence of rotation. However, angular rotation alters the path lengths, resulting in different frequencies for the two traveling waves. The two waves are optically heterodyned in a photodetector and the resultant beat frequency is directly proportional to the rotation rate of the "ring". An experiment verifying the existence of this phenomenon using a gas laser in the square "ring" configuration is described. The physics of mode pulling and various ways to minimize or bypass this problem are discussed in detail. Techniques for artificially separating the frequencies of the two waves by introduction of nonreciprocal elements into the optical path are described. Accuracy limitations caused by mechanical instabilities, excitation variations and inherent stimulated emission line width are examined. Successful implementation of the techniques described in this paper will lead to a laser angular rotation sensor comparable in accuracy to the best conventional gyros and having the additional advantage of "strap-down" operation, longer life, no warm-up time, direct frequency (digital) readout of angular rate, and eventually a lower unit cost. (Author)

N63-22578
Sylvania Electronic Systems, Waltham, Mass.
SUMMARY OF SPECTRAL SCANNING THEORY OF COLOR VISION
George Biernson. 9 Sep 63, 15p
Contract NASw-441 and AF33(657)8681
Research note 418; NASA CR-51807
OTS $1.60

DESCRIPTORS: *Color vision

N64-17599
University of Southern California, Los Angeles
AN APPARATUS FOR MEASURING THE REFLECTION, TRANSMISSION, AND PHOTOELECTRON YIELDS OF THIN METALLIC FILMS IN THE EXTREME VACUUM ULTRAVIOLET
Boyd MacNaughton and G. L. Weissler. 15 Feb 64, 28p
Grant NsG-178-61
NASA CR-53287
OTS $2.60

DESCRIPTORS: *Metal films, Optical properties, Measurement, *Optical instruments,

Solid State Physics

BNL-6295
Brookhaven National Lab., Upton, N. Y.
SECONDARY EXTINCTION CORRECTIONS FOR CYLINDRICAL CRYSTALS
Walter C. Hamilton. [Sep 62] 8p
Contract AT(30-2)GEN-16
OTS $1.10

TID-18438
Brown Univ., Providence, R. I.
RADIATION DAMAGE STUDIES IN SOLIDS USING TECHNIQUES OF ELECTRON-SPIN PARAMAGNETIC RESONANCE AND NUCLEAR MAGNETIC RESONANCE.
Annual progress rept. 1 May 62-30 Apr 63.
P. J. Bray and H. O. Hooper. 1 Mar 63, 58p.
Contract AT(30-1)2024
OTS $5.60

DESCRIPTORS: *Radiation damage, *Nuclear magnetic, Potassium, Hydrides, Crystals.

TID-16453
Cornell Univ., Ithaca, N Y.
DIELECTRIC PROPERTIES AT HIGH FREQUENCIES AND HIGH TEMPERATURES AND POINT DEFECT INTERACTION
H. S. Sack and G. C. Smith. [22 Aug 62] 17p
Contract AT(30-1)2471
OTS $1.60

DESCRIPTORS: *Sodium, *Potassium, *Silver, *Chlorides, *Bromides, *Dielectric properties.

AD-421 912
Electronic Properties Information Center, Culver City, Calif.
GERMANIUM DATA SHEETS
M. Neuberger. Sep 63, 63p
Contract AF33(616)8438
Rept. no. DS-131
OTS $1.75

DESCRIPTORS: *Germanium, *Semiconductors, Impurities, Absorption, Energy, Resistance (Electrical), Tables.

Data sheets are given concerning the absorption, dielectric constant, effective mass, and energy bands, gaps, and levels of pure and variously doped germanium. (108 references)

AD-422 916
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
RESEARCH ON VACUUM EVAPORATED AND CATHODE SPUTTERED THIN FILMS. Rept. for 1 Jul 61-15 Feb 62.
Richard B. Belser and William E. Woolf. Oct 63, 123p
Contract AF33(616)6379
WADD-TR-60-381, Part III
OTS $2.75

DESCRIPTORS: *Thin films, *Epitaxial growth, *Metal films, *Vapor plating, Vacuum apparatus, *Sputtering, Silver, Gold, Iron, Copper, Dysprosium, Thulium, Indium alloys, Antimony alloys, Electron microscopy, X-ray diffraction analysis, Sodium compounds, Chlorides, Magnesium compounds, Oxides, Lithium compounds, Fluoride.

Some 1,000 metal films were deposited by vacuum evaporation or sputtering on glass of monocrystals of NaCl, MgO or LiF and the structures of 628 were analyzed by electron or X-ray diffraction. A yield of 24 per cent parallelly oriented (PO) films for the total effort was increased bo 49.5 per cent during the last 10 months; a yield >80% could be expected by utilizing the best techniques developed. The conditions required for successful epitaxial growth of metal films on single crystal substrates are particular to the metal-substrate pair. Whereas for noble metals the conditions for successful parallelly oriented growth appear restricted to rather limited substrate choices, substrate temperature ranges, deposition rates and heating methods, and other very favorable conditions (the closed oven or the sputtering plasma): more active metals such as Cu, Ni and Fe can tolerate wilder and less well controlled ranges of these same conditions. This contrast in behavior suggests that the presence of a strong tendency toward chemical bonding between the metal and an element of the substrate or the presence of a favorable environment for chemical reaction such as the sputtering plasma greatly enhance the probability of achieving parallelly oriented metal film growth upon a selected substrate. (Author) (See also AD-277 800)

TID-16660
Illinois Univ., Urbana.
REDISTRIBUTION OF THE CONDUCTION ELECTRONS DUE TO POINT DEFECT COMPLEXES IN METALS. Technical rept. no. 33.
K. H. Bennemann. Jul 62, 41p
Contract AT(11-1)182
OTS $4.60

DESCRIPTORS: *Metals, *Electrons,

UCRL-7018-T
Lawrence Radiation Lab., Univ. of California, Livermore.
THE CRYSTAL STRUCTURE OF β - K_3 Bi
Donald E. Sands, David H. Wood, and William J. Ramsey. 8 Aug 62, 6p
Contract W7405-eng-38
OTS $1.10

AD-426 002
Motorola, Inc., Pheonix, Ariz.
RESEARCH AND DEVELOPMENT FOR SURFACE PROTECTION FOR SILICON DEVICES. Scientific rept. no. 5
S. S. Flaschen, H. W. Cooper, and M. A. Hall.
14 Sep 63, 41p.
Contract AF19(604)8358
AFCRL-63-536; N64-13640
OTS $1.25

DESCRIPTORS: *Silicon, *Semiconductor devices, Transistors, *Protective treatments, Surface area, Lithium compound, Peroxides, Effectiveness.

This report describes the progress made during this period in the control and application of semiconductor device surfaces, and in the electrical evaluation of device passivation coatings. Lithium peroxide controlled ambient material was applied to a substantial number of high reliability diffused switching transistors which have demonstrated favorable life test results. Surface oxidation by solution treatments has demonstrated improved collector breakdown voltage characteristics in a number of germanium alloy devices. A hypothetical model is proposed for alumina-silica films, and preliminary evaluations of an experimental film are presented. (See also AD-400 279)

AD-429 183 repriced
Revere (Althea), Vineyard Haven, Mass.
ELECTRON MICROSCOPE STUDIES OF THE SURFACE STRUCTURE OF WHISKERS GROWN FROM IRON CHLORIDE. Rept. on Characterization of Solid Phase and Interphase Phenomena in Chrystalline Substances. Nov 63, 37p
Contract AF33(657)8554
ASD-TDR-63-4136; N64-15094
OTS $1.00

DESCRIPTORS: *Single crystals, *Whiskers (Single crystals, *Crystal growth, Microstructure, Crystal lattice defects, Electron microscopy, Spark shadowgraph photography.

Additional evidence was obtained concerning the mechanism of filamentary growth as it is reflected in surface structure. Whisker specimens were produced [redacted] types of growth conditions with ultra-pure ferrous chloride containing small amounts of cobaltous chloride at 700°C. Although individual whiskers within each specimen boat may vary somewhat, their surface topography appears to follow definite patterns. In most specimens, regardless of growth conditions, these typical patterns show variation in surface structure from the base to the tip areas. Detail in surface contours appears to be more uniform in whiskers which develop well-formed tips. When whiskers grown with the addition of cobaltous chloride could be broken, their fractured cross-section surfaces exhibited a shell and core structure similar to that found in whiskers which were previously studied. A number of the fractured specimens had fine exterior surface detail which has not been seen in earlier whiskers. (Author)

N63-23007
Space Technology Labs., Inc., Redondo Beach, Calif.
CHARGED PARTICLE RADIATION DAMAGE IN SEMICONDUCTORS, III: THE ENERGY DEPENDENCE OF PROTON DAMAGE IN SILICON
J. M. Denney, R. G. Downing, and G. W. Simon.
4 Oct 62, 22p
Contract NAS5-1851
Rept. 8653-6005-KU-000; MR-22; NASA CR-51742
OTS $2.60

DESCRIPTORS: *Silicon, *Semiconductors, *Radiation damage, Protons, Charged particles

AD-422 041
Texas Instruments, Inc., Dallas.
ADVANCED FUNCTIONAL ELECTRONIC BLOCK DEVELOPMENT. Rept. for 15 Feb-15 May 63
J. R. Biard and W. T. Matzen. 18 Sep 63, 92p
Contract AF33(657)9824
Interim engineering rept. no. 03-63-36
OTS $2.25

DESCRIPTORS: Modules (Electronic), *Semiconductor devices, Circuits, Lasers, Electron optics, Piezoelectric effect, Thermal properties, Silicon, Filters (Electromagnetic wave).

Investigations of new semiconductor phenomena and circuit concepts for application in Advanced Functional Electronic Blocks are described. The work is divided into six specific tasks: (1) GaAs emission technology, (2) light multiplexing, (3) piezoelectric effects in semiconductor, (4) thermal effects, (5) silicon adaptive element, and (6) digital filter.

Theoretical Physics

N64-17694
060 800
Ames Research Center, National Aeronautics and Space Administration, Moffett Field, Calif.
RELATIVISTIC ROTATION AND THE INVARIANCE OF MAXWELL'S EQUATIONS
William C. Orthwein. Dec 63, 34p
Technical memo X-54018
OTS $3.60

DESCRIPTORS: *Relativity theory, Partial differential equations, Quantum mechanics.

N64-17573
Laboratories for Applied Sciences, Univ. of Chicago, Ill.
ABSOLUTE FLUORESCENT QUANTUM EFFICIENCY OF SODIUM SALICYLATE
Rinda Allison, Jay Burns, and A. J. Tuzzolino. [1962] 15p
Grant NsG-276-62
NASA CR-53230
OTS $1.60

DESCRIPTORS: *Fluorescence, Quantum statistics, *Salicylic acids.

UCRL-6981-T
Lawrence Radiation Lab., Univ. of California, Livermore.
A NOTE ON THE MAXIMUM BOUND PRINCIPAL QUANTUM NUMBER
Carl A. Rouse. Jul 62, 12p
Contract W7405-eng-48
OTS $1.60

DESCRIPTORS: *Field theory

TID-16793
Sandia Lab., Albuquerque, N. Mex.
SOME EXTENSIONS OF THE BORN APPROXIMATION FOR PHASE SHIFTS
Roger F. Dashen. [Oct 62] 17p
Contract AT(29-1)789
SCDC-2858
OTS $1.60

DESCRIPTORS: *Mercury, *Electrons, *Scattering

Thermodynamics

N64-17576
Institute of Engineering Research, Univ. of California, Berkeley.
EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF TRANSPIRATION COOLING ON A PARTIALLY DISSOCIATED TURBULENT BOUNDARY LAYER
R. N. Meroney (Masters thesis). 15 Nov 63, 68p
Contract NAS8-850
Rept. no. AS-63-6; NASA CR-53247
OTS $6.60

DESCRIPTORS: *Turbulent boundary layer, *Heat transfer, *Evapotranspiration.

UCRL-6450(Rev. I)
Lawrence Radiation Lab., Univ. of California, Livermore.
EQUATION OF STATE OF CLASSICAL SYSTEMS OF CHARGED PARTICLES
S. G. Brush, H. E. DeWitt, and J. G. Trulio.
21 Aug 62, 57p
Contract W7405-eng-48
OTS $5.60

DESCRIPTORS: Plasmas physics, Gases, Electrolytes, Bibliographies, *Charged particles, *Equations of state.

LA-3031
Los Alamos Scientific Lab., N. Mex.
A NEW SOLUTION CALORIMETER
George C. Fitzgibbon, Daniel Pavone, Elmer J. Huber, Jr., and Charles E. Holley, Jr. Dec 63, 24p
Contract W7405-eng-36
N64-17754
OTS $0.50

AD-429 077 repriced
Martin-Marietta Corp., Orlando, Fla.
TWO DIMENSIONAL ANALYSIS OF TRANSIENT HEAT CONDUCTION IN A SECTOR OF A HOLLOW CIRCULAR CYLINDER. Final rept., Jan-Aug 63, on Structural Analysis Methods
J. G. Torian and G. K. Bennett. Nov 63, 139p
Contract AF33(657)10315
Rept. no. OR 3351; ASD-TDR-63-642; N64-14817
OTS $2.75

DESCRIPTORS: *Thermal conductivity, Differential equations, Cylindrical bodies, *Two-dimensional flow, Transient, Surface temperatures, Mathematical analysis, Boundary valve problems, Heat transfer, Programming (Computers), Data processing systems.

An exact mathematical formulation was sought of transient heat conduction to reduce the amount of idealization required by currently employed finite difference techniques. A two-dimensional analysis is developed beginning with the differential equations for conduction of heat in a segment of a hollow cylinder in polar coordinates. An exact solution with constant thermal diffusivity and conditions of prescribed surface temperature, convection, and direct heat input is written in an infinite series of Bessel and trigonometric functions. Provisions are made for incorporating a coordinate varying, arbitrary, initial temperature

distribution as well as coordinate and time varying arbitrary surface conditions. A solution that incorporates the effect of temperature dependent thermophysical properties is developed by combining the exact solution with a finite difference approach. The solution has been programmed for an IBM 7090 or 7094 digital computer. (Author)

AD-422 069
Purdue Univ., Lafayette, Ind.
PREDICTION OF THERMAL CONDUCTIVITY OF METALLIC ELEMENTS AND THEIR DILUTE ALLOYS AT CRYOGENIC TEMPERATURES. Rept. for Sep 60-Jan 63, on Materials Application
Ared Cezairliyan, Doctoral thesis. Sep 63, 146p
Contract AF33(616)7617
ASD-TDR-63-291; N64-10546
OTS $2.75

DESCRIPTORS: *Thermal conductivity, *Metals, *Alloys, *Cryogenics, Theory, Experimental data, Correlation techniques.

A brief outline of the present theory of thermal conductivity of metals is given with particular emphasis to cryogenic temperatures. The Principle of Corresponding States is applied to thermal conductivity of metallic elements and their dilute alloys at low temperatures ($0 < T < \theta/10$, where is the Debye temperature). Based on the theory of metals and the Principle of Corresponding States a universal relation for the reduced thermal conductivity is obtained. Discrepancies between the theoretical and experimental results are investigated and the thermal conductivity relation is modified to remove these discrepancies. The interaction (coupling) between ideal and impurity thermal resistances is also treated. As a preliminary investigation, the Principle of Corresponding States is also applied to thermal conductivity of semi-metallic and non-metallic solids at low temperatures. (Author)

AD-431 203 repriced
Raytheon Co., Waltham, Mass.
DEVELOPMENT OF AN ULTRA-HIGH TEMPERATURE PYROLYTIC GRAPHITE THERMOCOUPLE. Final rept., 1 Jan-30 Jun 63
C. A. Klein, M. P. Lepie, W. D. Straub, and S. M. Zalar. Jan 64, 93p
Contract AF33(657)10332
ASD-TDR-63-844; N64-16594
OTS $2.25

DESCRIPTORS: *Thermocouples, High temperature research, *Pyrolytic graphite, Carbon alloys, Boron alloys, Thermoelectricity, Hall effect, Crystal lattice defects, Magnetostriction, Resistance (Electrical), Electron transistors.

Electrical and galvanomagnetic effect along the layer planes of three classes of pyrolytic graphites (heat-treated, as-deposited, and boron-doped) are investigated in the temperature range from 0 to 1000 C. It is shown that the simple two-band model with symmetrical upper and lower pi bands and zero-gap configuration provides an adequate description of the charge-transport mechanism. Carrier concentrations and mobilities substantiate previous conclusions derived from low-temperature work, and allow us to assess crystallite sizes on an independent basis. Theoretical evaluations of the Seebeck coefficient are performed in the framework of a formation presumed rigorous for semimetals. Critical information on the scattering parameter of pyrolytic graphite is thus deduced. Experimental Seebeck-coefficient results confirm the main features of the analysis, in particular the type reversal that occurs in turbostratic graphites at temperatures of about 500 C. Thermocouple-design feasibility studies reveal that PGB/PG systems are capable of operation at least up to 2800 C. (Author)

Wave Propagation

N63-23022
Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.
IONOSPHERIC ABSORPTION OF EXTRATERRESTRIAL RADIO WAVES
Larry W. Brown. Oct 62, 76p
NASA TM-X-50841; I-615-62-194
OTS $7.60

DESCRIPTORS: *Extraterrestrial radio waves, Ionospheric propagation,

HW-77464
Hanford Atomic Products Operation, Richland, Wash.
ULTRASONIC RESPONSE OF NOTCHES IN 35 MIL WALL ZIRCALOY TUBING
N. E. Dixon. 2 Jan 64, 20p
Contract AT(45-1)1350
OTS $0.50

HW-78701
Hanford Atomic Products Operation, Richland, Wash.
ULTRASONIC WAVE PROPAGATION MODELS FOR NONDESTRUCTIVE TESTING: LIQUID-LIQUID INTERFACES
C. E. Fitch, Jr. Oct 63, 46p
Contract AT(45-1)1350
N64-17701
OTS $1.25

N64-17594
Radiation Lab., Univ. of Michigan, Ann Arbor.
APPLICATION OF CONFORMAL MAPPING TO RADIATION AND DIFFRACTION OF ELECTROMAGNETIC WAVES
Soonsung Hong. 25 Feb 64, 3p
Grant NsG-444
NASA CR-53288
OTS $1.10

DESCRIPTORS: *Conformal mapping, *Electromagnetic waves, Diffraction analysis.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

AD-423 557
Aerospace Medical Research Labs., (6570th), Aerospace Medical Div., Wright-Patterson AFB, Ohio.
INFORMATION THEORY AND HUMAN BEHAVIOR: UNCERTAINTY AS A FUNDAMENTAL VARIABLE IN INFORMATION-PROCESSING TASKS
Karl L. Wiegand. Oct 63, 103p
AMRL-TDR-63-89; N64-11439
OTS $2.50

DESCRIPTORS: *Communication theory, *Behavior, *Reaction (Psychology), *Reflexes.

Three studies were performed to investigate the relationship between (a) stimulus uncertainty and simple reaction time, (b) joint stimulus-response uncertainty and choice reaction time and, (c) uncertainty in a complex information transformation task and reaction time. A linear relationship was found in each case. Further, the mean reaction time for performing the transformation task could be predicted remarkedly well using the rate of information transmission obtained in the choice reaction time task. (Author)

HW-80524
Hanford Atomic Products Operation, Richland, Wash.
HANFORD FORMAL RESEARCH AND DEVELOPMENT REPORTS, 1963, Jan 64, 34p
Contract AT(45-1)1350
OTS $0.75

N63-20242
National Aeronautics and Space Administration, Washington, D. C.
SPACE SCIENCE AND SATELLITE APPLICATIONS PROGRAMS. Rept. to the Space Science Board
H. E. Newell. Dec 62, 68p
NASA TM-X-50173
OTS $6.60

DESCRIPTORS: *Scientific research, *Satellites (Artificial),

AD-421 708
Office of Naval Research, Washington, D. C.
SOLUTION TO NAVY PROBLEMS THROUGH ADVANCED TECHNOLOGY. PROCEEDINGS OF NAVY SCIENCE SYMPOSIUM (NO. 7) May 14, 15, 16, 1963, U. S. NAVAL AVIATION MEDICAL CENTER, PENSACOLA, FLORIDA. [1963] 338p
Rept. no. ONR-16, Volume 1; N64-15101, N64-15102 includes N64-15119.
OTS $5.00
DESCRIPTORS: *Symposia, *Naval research, *Awards, *Intermetallic compounds, *Training, *Aviation medicine, *Life support, Deformation, *Metals, *Plastics, *Palladium, *Hydrogen, *Radiochemistry, *Sonar projectors, *Rare earth elements, *Microwave amplifiers, *Indium alloys, *Antimony alloys, Lead compounds, Sulfides, Tellurides, Tin compounds, *Semiconductors, *Composite materials, Glass, *Electromagnetic waves

Contents: NATO activities in research and development; Innovation: The new resource; Presentation of the Captain Robert Dexter Conrad Award; Acceptance of the Conrad Award; Intermetallic compound based materials for structural applications; Human quality control; Pilot performance during centrifuge simulations of acceleration environments; Research in life support systems for airborne and space vehicles; Elastic and plastic behavior in the finite deformation of metals by impact and explosive loading; Calorobic inorganic-organic polymers; Physical properties of the palladium-hydrogen system, Applications of radiochemistry to solution of radiological problems; Control of element velocity distributions in sonar projector arrays; Solid state spectroscopy of rare earth ions; Solid state microwave amplifiers; Properties and device applications of evaporated InSb films; Epitaxy of PbS, PbTe, and SnTe; In-pile hall electron transport property measurements on zone-refined, p-type silicon; Sources of strength and weakness in glass reinforced plastic structures; Propagation of hydromagnetic waves in an atmosphere of arbitrary electric conductivity

Communication Theory

AD-425 580
Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AIR/GROUND COMMUNICATIONS VIA ORBITING REFLECTORS. Presented at ASD 1963 Science and Engineering Symposium held at Wright-Patterson Air Force Base, Dayton, Ohio, 18-19 September 1963
Charles C. Gauder. Sep 63, 24p
ASD-TDR-63-702
OTS $0.75

DESCRIPTORS: *Microwave relay systems, *Reflectors Moon, *Communication satellites (Passive), *Space communication systems, *Communication systems, Surface-to-space, Space-to-surface, *Symposia.

A link analysis of an air/ground communication link operating at microwave frequencies via an orbiting belt of dipoles, a spherical reflector, and the moon is presented. The analysis shows that for communication ranges in excess of 4000 miles, reliable digital communications at information rates varying from 50 to 1500 bits per second are feasible. Included in the analysis is a cursory examination of the time-frequency perturbations prevalent in an orbital dipole channel. Results of an analog computer simulation of the dipole channel propagation characteristics substantiating to a certain degree theoretical studies relative to the use of coherent pulse integration techniques are also presented. (Author)

N64-17194
Maryland Univ., College Park.
PROCEEDINGS OF THE SPACE COMMUNICATIONS INSTITUTE AT MARYLAND UNIV., COLLEGE PARK, JUNE 23-28, 1963
1963, 110p
Grant NsG-482
NASA CR-53170; includes N64-17195-17202
OTS $9.10

DESCRIPTORS: *Space communication systems, Symposia, Reports.

AD-299 535
Stanford Electronics Labs., Stanford Univ., Calif.
THE BINARY CODING PROBLEM FOR A RANDOM CHANNEL
R. A. Scholtz. Jan 63, 34p
Contract Nonr-225(24)
Technical rept. no. 2004-7; SEL-63-002
OTS $3.60

DESCRIPTORS: *Data transmission systems, *Communication theory, *Signals, *Coding, Optimization, Computers, Probability, Matrix algebra, Binary arithmetic,

The general optimum receiver is found for a class of random channels through which a binary code is being transmitted. Under certain simplifying assumptions the divergence is calculated and used as a measure of system performance. The divergence is then maximized to yield a simple coding criterion involving a specification of the optimum Hamming distance between code words as a function of two channel parameters and the code word length. Intuitive justification and interpretation are given after each optimization procedure has been indicated mathematically. (Author)

AD-299 526
Stanford Electronics Labs., Stanford Univ., Calif.
LEARNING THE MEAN VECTOR AND COVARIANCE MATRIX OF GAUSSIAN SIGNALS IN PATTERN RECOGNITION
D. G. Keehn. Feb 63, 44p
Contract Nonr-225(24)
Technical rept. no. 2003-6; SEL-62-155
OTS $4.60

DESCRIPTORS: *Communication theory, *Signals, *Pattern recognition, Vector analysis, Matrix algebra, Probability,

The work presents a statistical approach to the problem of pattern recognition. The class of pattern-recognition problems considered is completely general and the results may be applied to problems independent of their natural origin. The pattern observations are viewed as vectors in a signal space on which a gaussian probability law is defined for each pattern class. The mean vectors and covariance matrices of these laws are taken as random objects with known probability laws, and learning observations for each class are assumed. The optimum classifier, the classifier which uses all the available information to minimize the probability of misrecognition, is derived. The interpretation of the optimum classifier reinforces an intuitive solution. The a priori probability law for the unknown parameters is shown to have the important property of reproducing itself with respect to the general gaussian model. For a random covariance matrix the inverted Wishart law reproduces itself and is interpretable as being equivalent to a random filter which takes a gaussian process into a Student process. The equivalent probability law on the random filter is derived and shown to be invariant under cascade with fixed filters. (Author)

AD-421 511
Stanford Research Inst., Menlo Park, Calif.
TACTUAL PERCEPTION OF VISUAL INFORMATION
James C. Bliss, Brian King, Kenneth Kotovsky, and Hewitt D. Crane. Dec 63, 79p
Contract AF33(657)8824
ASD-TDR-63-732; N64-14689
OTS $2.00

DESCRIPTORS: *Touch, Psychophysiology, *Stimulation, Perception, Pattern recognition, *Bionics, Computers, Communication theory, Jets, *Human engineering, *Display systems.

Objectives of this research are the determination of the psychophysics of air-jet stimulation of the tactual sense, the design and construction of a system for displaying processed two-dimensional images tactually, and the determination of the extent in which two-dimensional images presented to the tactual sense can be perceived.

It is hoped that the basic knowledge resulting from this research will lead to devices and systems which can increase human effectiveness in situations where communications using the visual and auditory channels are impaired or are already at capacity, for instance, during launching or piloting of a space vehicle. (Author)

SOCIAL SCIENCES

AD-425 581
Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SYSTEM COMPONENTS INFORMATION CENTER. Presented at ASD 1963 Science and Engineering Symposium held at Wright-Patterson Air Force Base, Ohio, 18-19 September 1963
Marvin G. Toll. Sep 63, 34p
ASD-TDR-63-695
OTS $1.00

DESCRIPTORS: *Inventory control, Air force equipment, *Information retrieval, *Management engineering, *Symposia.

This report describes a proposed information transfer program for the selection and approval of components used in Air Force systems. It is intended for use by designers and also by the management group approving what the designers recommend. A method is presented showing how technical characteristics are used as the basis for item selection. When a complete characteristic description is determined, an established index code substitutes numbers for the particular words thus permitting rapid machine search and retrieval. The program employs 1000-ft roll microfilm facilities for storage and retrieval. It features technical summaries of engineering data as the output for quick determination as to whether the selected items satisfy the requirement. (Author)

TID-16680
Sandia Corp., Albuquerque, N. Mex.
THE SYSTEMATIC SURVEY: KEY TO INFORMED CHOICE OF SUPPLIERS
Ralph R. Davies. [24 Sep 62] 9p
Contract AT(29-1)789
SCDC-2835
OTS $1.10

PB-181 562
Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS May 64.
OTS $1. 25, $10. 00/year

DESCRIPTORS: *Naval research, Scientific research, *Satellites (Artificial), *Infrared spectroscopy, Display systems, *Chemistry, Fluorescence, Plastics, Sodium, Potassium, *Mechanics, Ultrasonic radiation, Steel, Accelerometers, Waveguides, *Metallurgy, Aluminum alloys, Niobium, Titanium, Electrom beams, Palladium, Silver alloys, *Nuclear physics, Atomic spectroscopy, *Radio, Radio receivers, Wave transmission,*Solid state physics, Superconductors, *Acoustics, Patents

Contents:

Articles:

The NRL Solar Monitoring Satellite Program, by R. W. Kreplin

Attenuated Total Reflectance. Infrared Spectroscopy an an Analytical Tool, by R. A. Miller and F. J. Campbell

Scientific Program:

Applications Research: A satellite position prediction and display (SPAD) equipment for shipboard use

Chemistry: Photographic x-ray fluorescence data for fixed-crystal cameras. Surface chemistry of glass-fiber reinforced plastics. High-temperature properties of sodium and potassium

Mechanics: An ultrasonic vibration technique for studying crack-propagation velocity. Study of plane strain in radiation-embrittled steels. Electronic accessories for strain-gage acceleromters. Measurement technique for variations in the dimensions of small waveguides

Metallurgy and Ceramics: Fracture toughness characteristics of aluminum alloys measured by the NRL drop-weight tear test. Contribution of intermetallic particles to the fracture of aluminum alloy 7075-T6. Diffusion in niobium-titanium alloys. Brightness and two-color pyrometry applied to the electron beam furnace. Effect of oxygen on the creep-rupture properties of niobium. Environmental fatigue. Heat capacity of H-Pd at liquid helium temperatures. Mechanical properties of the Ag-Al hexagonal intermediate phase. In-depth embrittlement of a reactor pressure vessel steel (A302-B)

Nuclear and Atomic Physics: Coulomb approximation oscillator strengths of spectral lines from light and medium elements

Radio: Evaluation of an oblique ionosphere sounder receiver. Study of waves in a small tank. The helium-neon laser

Solid-State Physics: Superconductivity observed in high-purity tungsten

Sound: Numerical computation of radiation impedance of zonal arrays on a hard prolate spheroidal baffle. Neliac program for calculating prolate radial spheroidal wave functions. Neliac program for calculating spheroidal wave function eigenvalues and expansion constants

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	S-34	ANL-FGF-364
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Valves	S-21	UCRL-10326
Vanadium alloys	S-38	ORNL-TM-542
Vapor plating	S-48	AD-422 916
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Venus	S-1	N64-17593
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Viscosity	S-8	CONF-154-1
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Waveguides	S-41	LADC-5474
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		AD-421 909
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		AD-422 458
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- Establishing a new business

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- Distribution channels, facilities and services
- Marketing and distribution statistics

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- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

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